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VOLUME 141 NO. 10 SEPTEMBER 2 1961 ONE SHILLING

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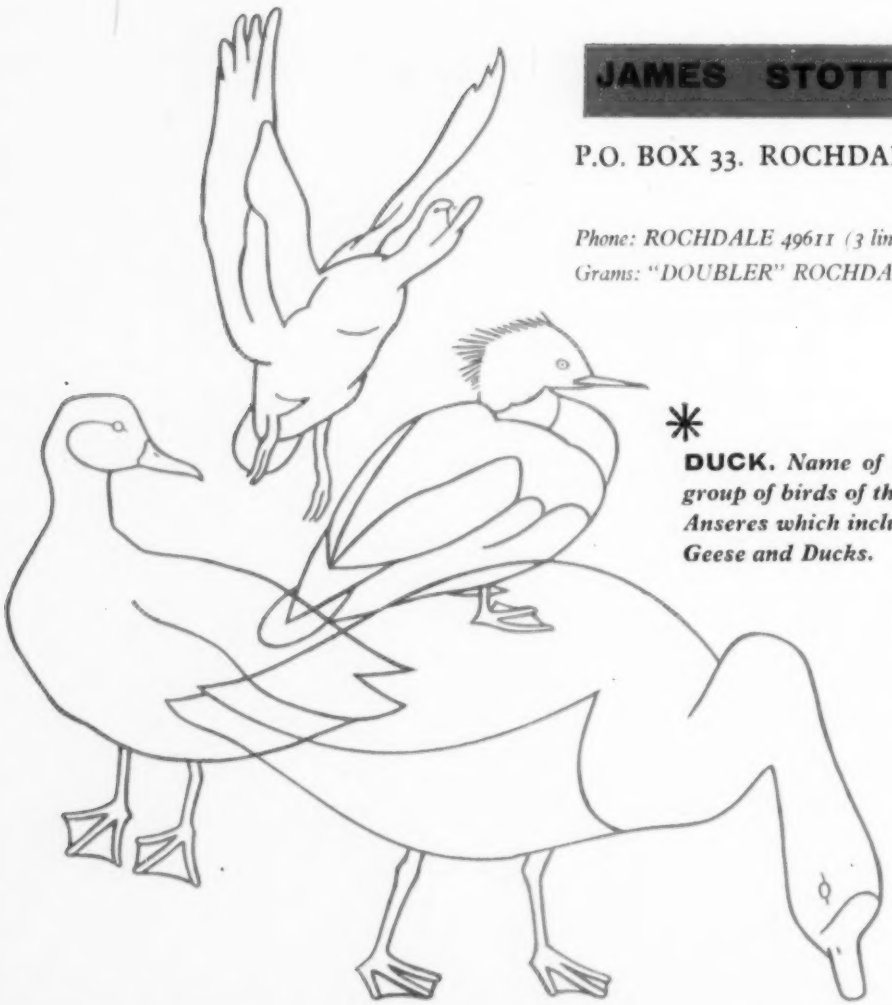

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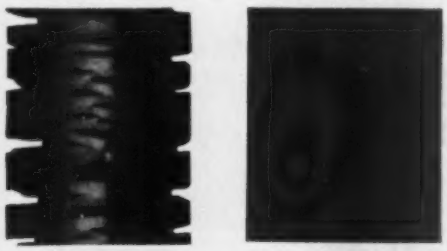

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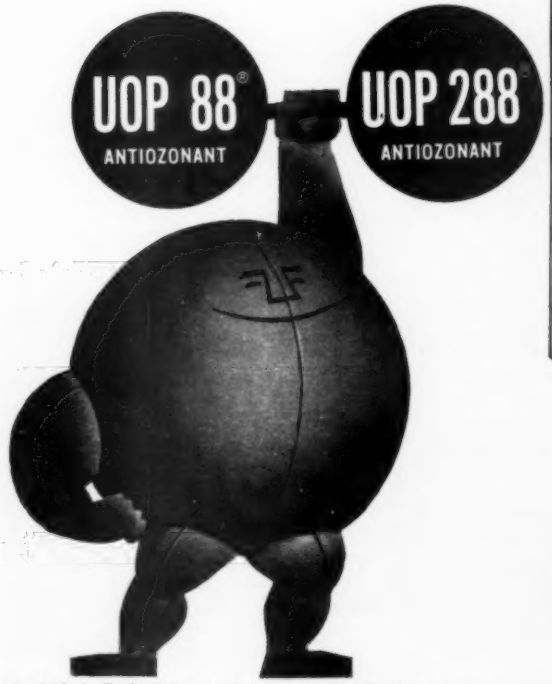

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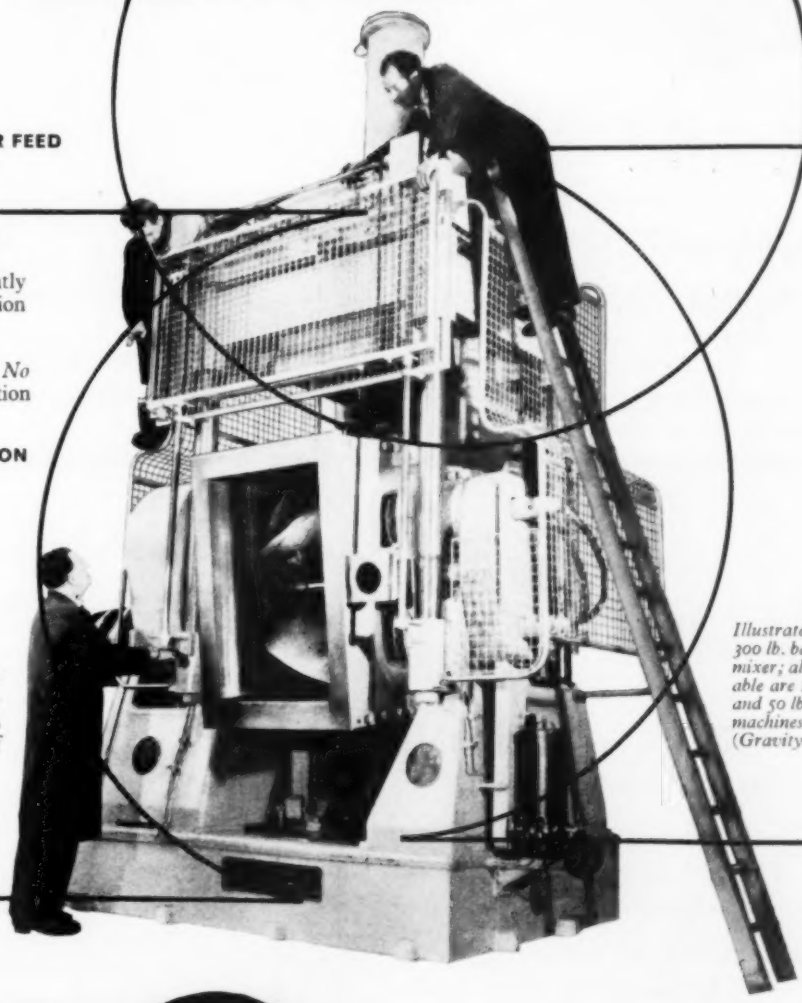

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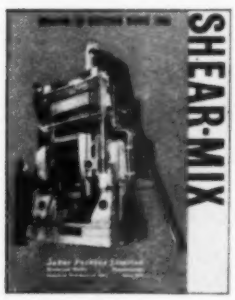

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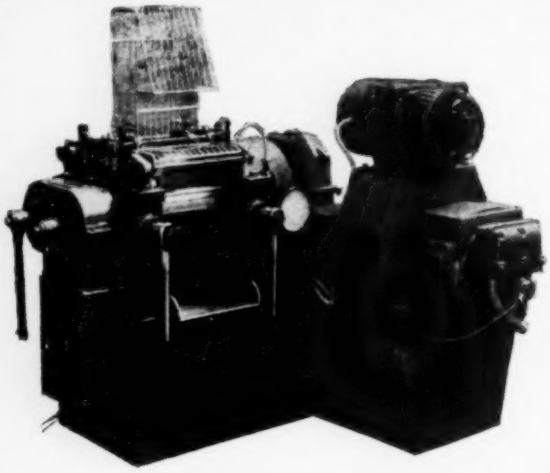

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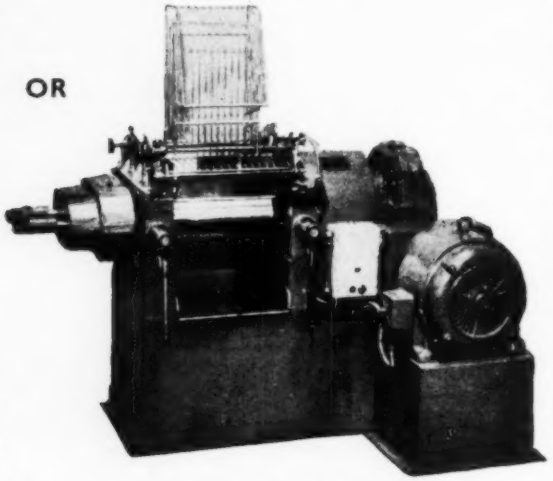

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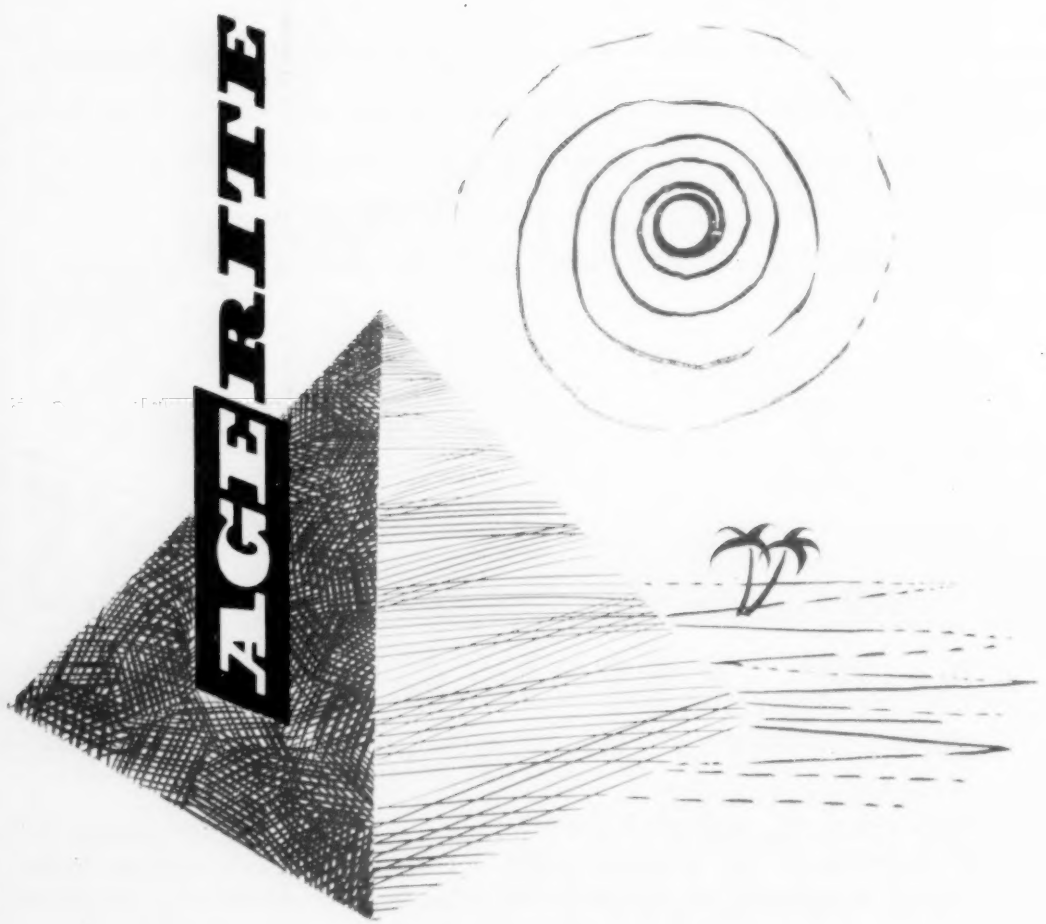

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Technical Editor: RICHARD NYE, MA

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RUBBER and PLASTICS WEEKLY

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Volume 141 *IN ITS 78th YEAR* **No. 10**

September 2 1961

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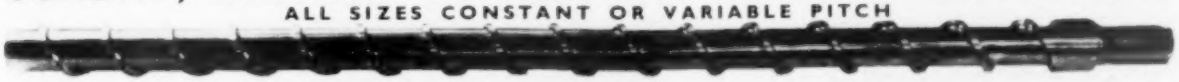

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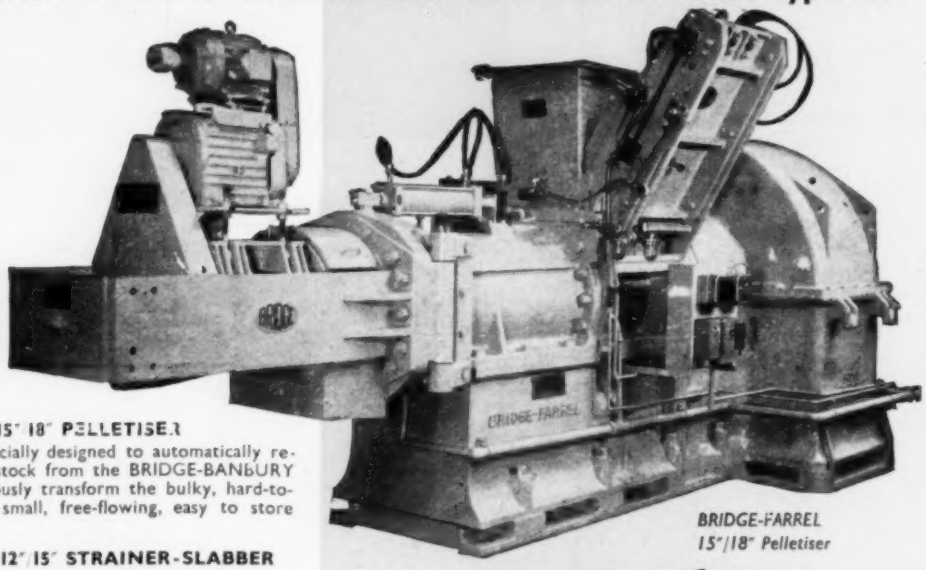

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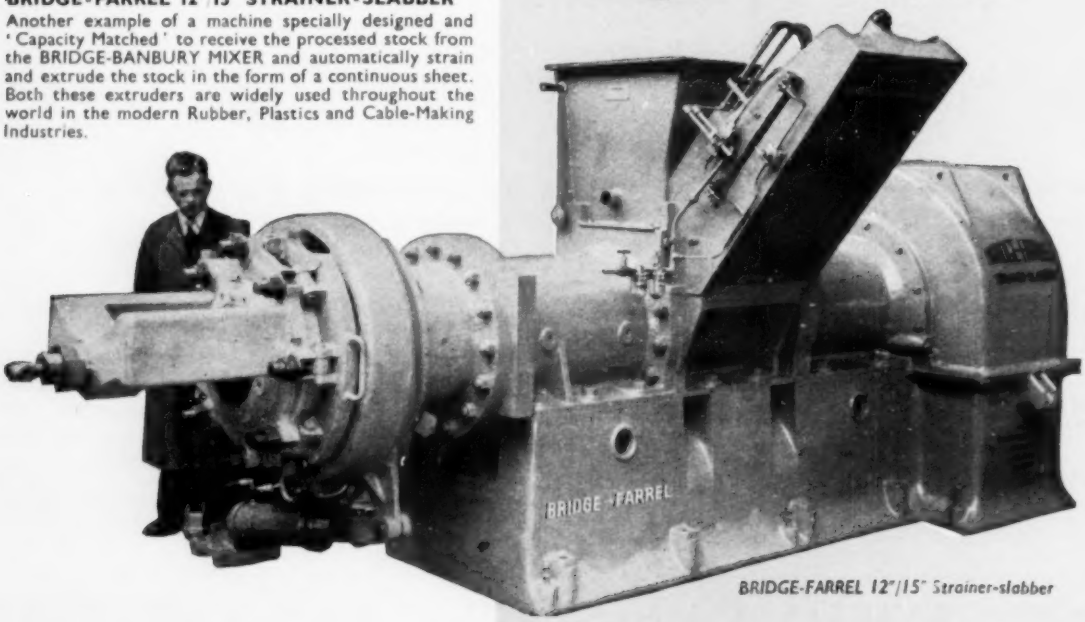

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NOTES of the WEEK

Economic Thermometer

GIVE the much harried, much criticized Chancellor of the Exchequer his due. Neither his big nor his little budgets found much favour, but he deserves a bouquet for his activities last week, when he held important meetings on long-term planning with the employers and the trade unions. These meetings mark the beginning of a development that will eventually be of great significance to industry as a whole, and to every individual manufacturer. So much of the production of the rubber and plastics industries is geared to that of other industries that planning ahead and taking an overall picture is essential if we are to avoid the disturbing effects of recurring crises. This is not a plea for planning controls, but for a better guide to what should be produced and when.

The Chancellor made two suggestions for long-term planning. One was for an entirely independent body on the lines suggested by the Heyworth Council (the 'Three Wise Men'); the other for a two-tier body. The latter would consist of an 'office', staffed by economic experts and independent of the Government. This would dip an economic thermometer into various industries, collate the readings, and make recommendations to the top-tier, which would probably have the Chancellor as its chairman, and contain representatives of the employers and the trade unions. Although any final decisions would rest with the Government, the two-tier body would clearly constitute a powerful weight of opinion. Any extra control exerted over industry would be more than compensated for by this very considerable say industry would have in the matter. Also, any recommendations accepted by the Government would be implemented smoothly — since both sides of industry played a part in their formulation.

Rubber in the Economic Picture

IN fact, this idea of a two-tier rather than an independent body was strongly supported by the employers' organizations. The idea is similar to that discussed at the Federation of British Industries' conference at Brighton last November, which Sir Norman Kipping, director-general of the FBI, explained to the Federation of British Rubber and Allied Manufacturers at their annual meeting a month ago. At this meeting Sir Norman referred to the possibility of the discussions with the Chancellor which have now taken place, and talked about the problems of long-term growth. The rubber industry is fortunate that it was put in the picture at this stage. To illustrate the importance of correct thinking on economic planning we cannot do better than quote part of Sir Norman's address to the FBRAM:

'I wonder what the rubber industry might do about it [economic planning]. I wonder, supposing your industry were invited to consider — in a vacuum — what it would think was the probable trend of its own affairs in the course of the next five years. Of course, you will say, "How can we do that until we know what the motor industry thinks?" or "How can we do that until we know what is Government policy with regard to investments?" . . . But supposing simultaneously the motor industry, and many other industries, were to make a similar attempt to project their ideas of where they thought their industry might go in the course of five years . . . could there not be built up out of this something which is better than nothing? Something which would give some sort of guide, which for the first few years might be full of errors, but which over the years might begin to get somewhere?'

Outside the Product

WHAT started off as a pack — something to hold the product, or to keep it clean — has become part of the product itself. Good packaging seems to have become essential if manufacturers are to move their goods with any speed from the shelves of Britain's 7,000 self-service stores. Even plastics technologists we have heard talking film seem to speak as much in terms of 'crisp feel' and 'eye appeal' as tear strength and permeability. Whether we deplore this tendency to buy outside rather than inside the goods or not, the fact remains that it is there. And if we are plastics manufacturers with a stake in packaging we do not deplore it — as a glance at this booming section of the industry at the International Packaging Exhibition will show.

The emphasis at the exhibition, which opens at Olympia on Tuesday (September 5), will more than ever be on plastics. Although there have been developments in the use of traditional materials, they do not approach developments such as those in the blow-moulding, lamination, vacuum and skin-packaging fields. Firms associated with traditional materials are becoming more and more aware of this — as is shown by the entry of the paper groups into the field.

The growth in importance of the pack is shown by the growth of this exhibition — at 300,000sq.ft. it is twice the size of the 1955 exhibition. Four hundred firms will display machinery, materials and products; including about 70 foreign manufacturers. On pages 363-376 we publish our own pack for the exhibition — a preview and some articles on packaging specially written for *RPW*. A full report on the exhibition will be published in our September 16 issue.

NEWS *Briefs*

NEW US RUBBER LOW PROFILE TYRE — ISRAEL TO MAKE GRP—JAPANESE POLYTHENE DEMAND DOMINICAN LATEX FACTORY—HUNGARIAN PVC

●**Thailand** — Three American tyre companies — Goodrich, Hercules, and Mansfield Tyre and Rubber — are negotiating with the Thai Board of Investment about the setting up of a joint motor vehicle tyre manufacturing project. Board of Investment sources said that representatives of the American concerns would arrive in Bangkok soon to discuss the project with Thai officials and submit the application for promotional privileges. Thailand in 1960 imported over 200,000 tyres.

●**United States** — The United States Rubber Co. has announced a new low profile tyre for the forthcoming 1962 model cars. Low profile tyres are said to be cooler running, to reduce power consumption and to have added stability. Called the United States Royal Safety 800 the new tyre is in large scale production at plants in Detroit, Los Angeles, Eau Claire, Wisconsin, and Chicopee Falls, Massachusetts. The company says the new tyre will give more than 14% more tread mileage than the tyre it replaces.

●**Singapore** — Singapore and Malaya have agreed to set up a Working Party to examine specific implications arising from Singapore's possible future merger with Malaya. This was officially announced in Singapore on August 24 in a joint Malayan/Singapore communique.

●**United States** — The Goodrich Tyre and Rubber Co.'s Miama, Oklahoma, tyre plant has been on strike for the past five weeks. The Federal Mediation and Conciliation Service is trying to settle the dispute. A spokesman said that the other Goodrich plants were working 'without any difficulty'.

●**Canada** — The Dominion Bureau of Statistics has reported that Canadian casein production during July 1961 amounted to 2m. lb. compared with 1.9m. lb. in June and 1.4m. lb. in July 1960. Production for the first seven months of this year totalled 6.3m. lb. as against 5.1m. during the corresponding period of 1960.

●**Dominican Republic** — A factory for latex production was opened at Piedra Blanca in the Dominican Republic on August 15. A plantation of 5,000 rubber trees is now in production there. A factory is also to be built at Majagual where plantings of rubber trees total 250,000. The Dominican Republic Government recently set aside $30,000 for planting new rubber estates.

●**Argentina** — Industrias Petroquimicas Argentinas Koppers (IPAK) is building a factory near La Plato at a cost of about 2,000m. pesos for the manufacture of plastics material. Production will begin next year and will represent an annual foreign exchange saving of nearly 600m. pesos.

●**Canada** — Two major construction projects costing $89m. have been announced by the Shawinigan Water and Power Co. These are expected to take place during the next four years, and will increase generating capacity by 27%. A thermal electric station is to be built at Tracy and a hydroelectric development at Rapids des Coeurs, both in Quebec. In conjunction with the thermal electric station a $20m. petrochemical plant is to be built by Shawinigan Chemicals at Varennes.

●**Japan** — The Japan Polyethylene Products Industrial Association has recently completed estimates for the demand for polythene during the next ten years. According to these forecasts the demand in 1970 is likely to be 710,000 tons — six times the present figure. This estimate is made up of 433,500 tons of low density polythene and 285,500 tons of medium and high density material. Exports of polythene are expected to reach 36,000 tons in ten years' time.

●**Israel** — A plant for the manufacture of reinforced plastics goods will be opened shortly at Tzihor in the Southern Neger. Know-how for the plant is reported as being supplied by a UK firm.

●**Hungary** — A plant for the production of pvc powder is under construction at Berente. Annual production capacity of this plant will be 6,000 tons and when it comes on stream Hungary will become independent of imports of the material.

●**France** — A plant for the production of Ixan, a copolymer based on vinylidene chloride, is in the course of construction at Tavaux. This is being built by the French company of the International Solvay group and will have an initial capacity of 5,000 tons per year which will later be doubled. The product, available in three grades, is used for coating papers, film and foils.

'It gets me to the Bazaar and back, but I'm trading it in for one of these new nylon fabric jobs!'—552

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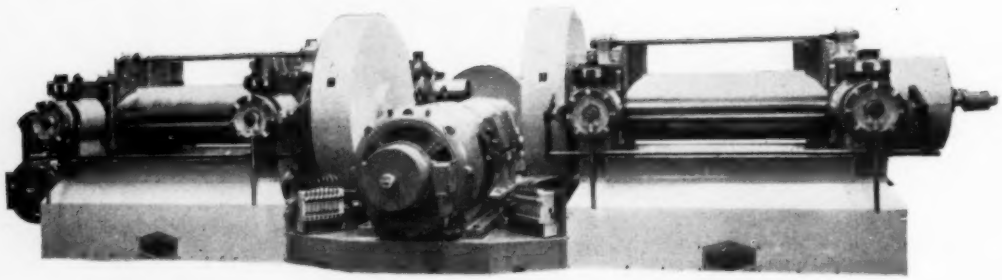

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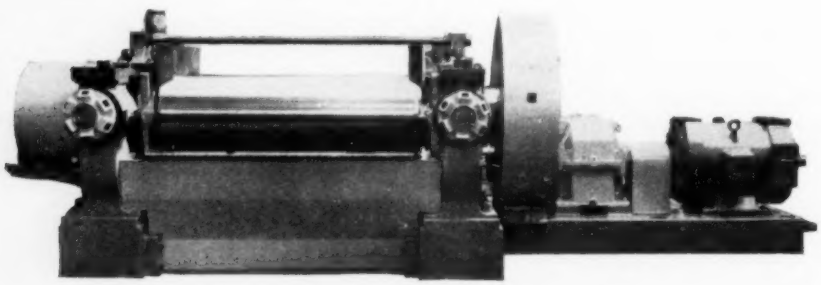

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Plastics Sales Hit New High

POLYOLEFINES 27% UP ON LAST YEAR

ACCORDING to figures issued this week by the Board of Trade, the sales of UK manufacturers of plastics materials reached a new record level in the second quarter of 1961. The figure of 152,800 tons is 10,800 tons higher than the previous best, recorded in the first three months of last year, and 14,000 tons higher than the second quarter of 1960.

This improvement is largely accounted for by higher exports and the replacement of imported by home produced materials. Direct exports for the April-June period, at 46,300 tons, were 4,000 tons higher than the same period in 1960, while imports, at 20,300 tons were over 5,600 tons less.

More than half of this increase has been in the sales of polyolefines and polystyrene, which were both 27% higher than a year ago. Polythene and polypropylene films are being widely used in packaging and polystyrene, despite setbacks in refrigerator sales, has made ground in radio and television applications.

The situation in the polyolefine field is of considerable interest, for it has been here that the competition has been fiercest. Polythene prices have been cut five times in the last three years, the last barely a month ago (*RPW* August 5, 219), and the material is now little more expensive than pvc. It would seem, from the lower import figures, that these price reductions have at least been effective in reducing the level of cheap imported materials, and the low price is also expected to open up new markets for polythene, especially in the packaging field.

These price cuts, which have taken place on an international scale, led by the USA and Italy, have had a more far reaching effect on the British Plastics Industry which is only now becoming apparent. The profit margins on some products have now been reduced to such a level that it is no longer economic to invest in technical sales drives and product development. Because of this the number of vertical combines and alliances which have recently sprung into being has increased, so that the raw material supplier, the plastics manufacturer and the fabricator share the costs and profits of developing new products and markets.

Two such combines announced recently were those between I.C.I. and E. S. and A. Robinson, and between Metal Box, Shell and National Distillers Corp. (*RPW* August 5, 204), both with the stated intention of developing the uses of plastics films in packaging.

New Packaging Company

The Commercial Plastics group of companies has announced the formation of a new subsidiary — Plastics Containers Ltd. — which has been established to give added emphasis to the promotion of the group's products in the development and manufacture of containers.

The new company will offer design, advisory and production facilities for plastics packaging and will operate from Commercial Plastics' new London office in Berkeley Square (see p. 354).

Bakelite Cuts Melamine Laminate Price

BAKELITE LTD., manufacturers of Warerite decorative melamine laminates, has slashed the price of a comprehensive range of designs in its Warerite veneers. The list price is now down to 3s. 2d. a sq. ft. instead of 4s. Furniture and allied trades, builders and contractors are allowed varying discounts according to the scale of their requirements.

The effect of the reduction — which, the company says, has been made possible by increased capacity and productive efficiency — will be to broaden the outlets for the material and also to strengthen the ability of many users, such as those in the furniture industry, to keep costs down and compete more favourably in overseas markets.

The laminates, which are being retailed now at the reduced prices, have been manufactured in this country since 1932 and are widely distributed throughout the UK and abroad.

New PI Council Chairman

L. M. READ, ARCS, AMIChemE, FPI, is the new chairman of Council of the Plastics Institute.

Mr Read was born in London but attended school in Canada and the United States. He went to Geneva College in Pittsburg and Princeton University, completing his university training at Royal College of Science in London.

In 1928 he joined the Columbia Gramophone Co. as a materials chemist and in 1933 was transferred to Hayes, Middlesex, as research chemist in charge of the Works Designs Laboratories of the new Electrical and Musical Industries Ltd.

He joined Rockhard Resins Ltd. in 1935 as assistant works manager and became works manager of Cellomold Ltd., following the merging of this company with Rockhard Resins. After the amalgamation of Cellomold Ltd. with British Resin Products Ltd. he became works manager of the BRP Feltham factory, and is now administration and services manager, Research and Development Laboratories, DCL Plastics Group.

The new vice-chairman of Council is Maldwyn Jones, BSc, FIRI, FPI, who worked from 1927-30 in the technical department of the Dunlop Rubber Co. From 1930-45 he was employed in the Rubber and Resins Service Department of the Dyestuffs Division of I.C.I. In 1946 he was appointed manager of the Technical Service and Development Department of the Plastics Division of I.C.I. and since 1957 has been development director.

Building Sub-Committee

The Plastics Institute has set up a Building Sub-Committee to deal with all matters, consistent with the objects of the Institute, relating to the development of the use of plastics in building. The following are members:

H. D. Atkin (Allied Structural Plastics Ltd.), G. A. Britton (John Laing Research and Development Ltd.), Dr W. B. Brown (Monsanto Chemicals Ltd.), Dr W. Dawson (Imperial Chemical Industries Ltd., Plastics Division), D. Gonda (EPS (Research and Development) Ltd.), D. B. Honeyborne (Building Research Station), D. S. Mahon (Bakelite Ltd.), Dr Z. S. Makowski (Imperial College of Science and Technology), H. Stanley Smith (Richard Costain Ltd.), K. Turner (Chartered Architect), and V. H. Wentworth (Monsanto Chemicals Ltd.).

DSIR Headquarters Move

The DSIR Headquarters is now at State House, High Holborn, London, W.C.1, (Telephone: Chancery 1262.) All correspondence should now be addressed there and telephone enquiries made on the new number from Monday, September 4.

CO-OPERATIVE RESEARCH

Times were when scientists pursued their urgent but sometimes vague enthusiasms in a sort of ivory tower detachment. In many cases they were either unaware of or cared nothing for the needs and aims of industry. Those days are long since gone. Research in most fields now is a two-way business.

Thus in the field of rubber antioxidants, research is based on co-operation between organic and physical chemists and the rubber technologists. Years of experience have built up a background of information on the influence of chemical structure on technical efficiency, and the correlation between chemical activity and technical effect.

The build-up of knowledge over some 30 years has in this way been a live and progressive process, combining the tools of organic preparative, analytical, and technological science and enabling I.C.I. to offer currently to the rubber industry a range of non-staining antioxidants of exceptional variety.

Adequate definition of the target in mind is followed by selection of the particular field of chemistry. Certain sorting tests can be carried out by the organic and physical chemists, the more likely candidates among the compounds prepared being subjected to technological evaluation.

Before a new antioxidant is launched a thorough evaluation is carried out. In the preliminary stages a limited number of test-compounds are submitted to conventional ageing tests in the oxygen bomb and the air oven. For this purpose I.C.I. maintain a unit comprising four large oxygen bombs held at 70°C and a smaller oxygen bomb unit which can be operated under various conditions as required. Air oven ageing is carried out in fluid-heated individual container units in order to avoid cross-contamination and to ensure constant temperature. Staining tendencies are evaluated by exposure of rubber to a u.v. light source or to sunlight, the degree of discoloration being measured by means of a reflectance spectrophotometer. A Xenon-lamp unit has been recently installed and is expected to replace the u.v. lamps as a source of illumination.

There follow then more detailed evaluations on different rubber compounds based on natural and synthetic rubbers. The range of tests is extended to include high-temperature air oven ageing and flex-cracking. Special applications involve the measurement of properties such as compression set, extractability, and migration. Conventional ageing tests are supplemented by measurements of oxygen absorption and stress relaxation.

Hundreds of chemicals are subjected to preliminary sorting tests but of these only a few undergo detailed evaluation. This is not because the many show no merit but because they lack the particular qualities that are being sought. The final result is a range of non-staining anti-oxidants which offer a product for almost every application. New products will be added to the range and older products will gradually be replaced as they become out-moded.

Co-operative research continues.

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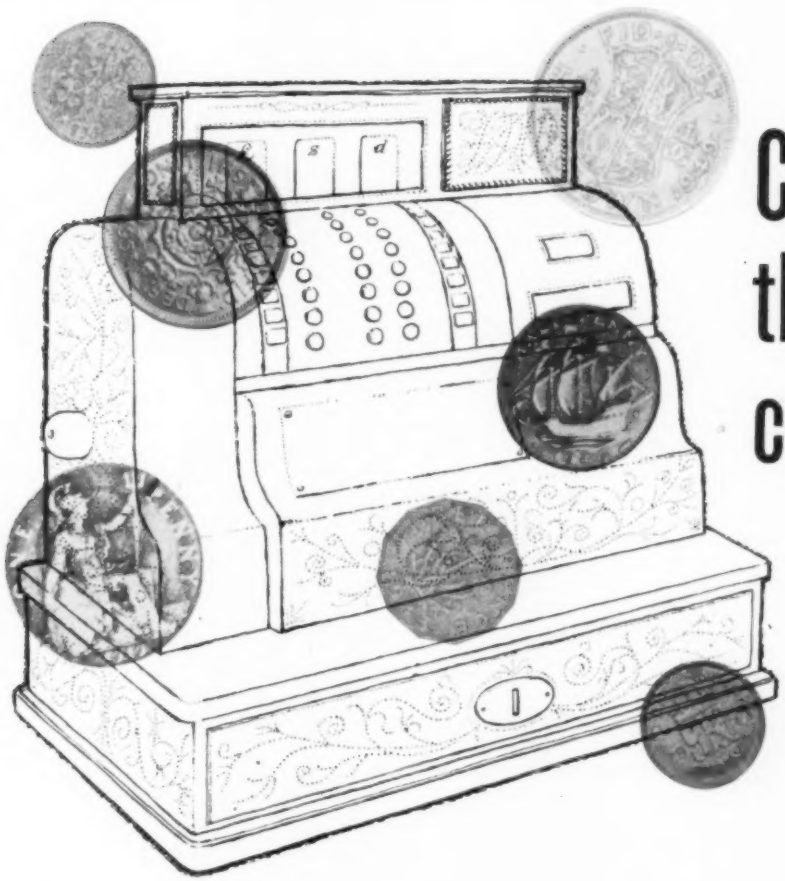

Counting the cost

Some non-staining antioxidants may seem expensive in terms of purchase price per lb.—but this ignores the question of technical efficiency.

Calculating in terms of cost per unit of technical efficiency, a higher cost per lb. can well result in a lower cost per unit. A high degree of protection can only be achieved with an antioxidant of high technical efficiency. Further, an antioxidant of *high* technical efficiency can be used in *appropriate* dosages to obtain just the degree of protection required.

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C

PLASTICS MACHINERY DEVELOPMENTS

Automatic Vacuum-Forming Machine

EASILY OPERATED AND VERSATILE

By JOHN SHEARING

THERE should be no surprise nowadays when the most unlikely processes become automatic. Vacuum forming was essentially a hand process, but even this, as we saw at Interplas, has received the attentions of the automation experts. Gone are the days, if a manufacturer is to remain competitive, when he can rig up a vacuum tank himself, with a pump borrowed from the chemical laboratory or a vacuum cleaner!

One of the leaders in the vacuum forming field is F. J. Edwards Ltd., well-known manufacturers of the Bescovac fully automatic vacuum-forming machine. Apart from being automatic, selective push-button control can be employed to give a very flexible choice of forming sequences. The important feature of this high degree of control is that once set, the machine can be operated by unskilled labour.

Pneumatic Operation

The machine, of all-steel construction, is very robust. It has three panels of control equipment, normally an undesirable feature but since they are all at the front they are most accessible.

The basic features are, of course, the drape table and clamp frame. The former is pneumatically operated and gives a smooth, positive action, most important in the interests of precision. The speed at which the table rises and the depth of down-stroke are each controlled to offset the cooling effect on the sheets and also to speed up production times, which can be permitted when shallow forms are being made. The table can be locked in the upper position for straight vacuum forming.

Independent Control

The clamping frame is also pneumatically clamped and has push-button control independent of other features. This is claimed to be one of the advantages of the Bescovac machine, since one of the normal disadvantages of automatic types is the use of pillars around the frame which impede access. There are no pillars on this model so that the automatic machine has all the advantages of manual clamping. In addition, the hinged movement of the frame makes it very easy to load which is most important with thin, flexible sheets. Here they can be manoeuvred into position, the frame lowered by hand and when exactly in position the switch is operated to give positive clamping.

The heater is an Elstein high-grade infra-red type divided into three concentric zones, each with independent temperature control, which is a most important feature. This variability enables complicated mouldings to be formed without difficulty. The advance and withdrawal mechanism of the heater is pneumatically operated, either combined in the automatic cycle or by push-button control. An electric interlock prevents inflation of the plastic sheet or the raising of the drape table before the heater box has withdrawn.

Pre-Stretching

Stretching problems arise when high male moulds are used due to unequal movement of the sheets. The Bescovac incorporates pre-stretching by inflation to distribute the thinning of the sheet in just such instances as this. Inflation can also be employed to assist in the removal of finished mouldings from the former or mould.

There is also a special device for pre-stretching downwards by partial vacuum before the drape operation takes place. This enables certain covering operations to be performed and prevents air pockets being trapped when large flat surfaces have been pre-coated with adhesives. A valuable feature is a safety two-way air valve which prevents damage to the walls of the forming chamber through over or under-pressurizing.

Plug assistance forming is also possible. The Bescovac is designed to take an overhead long-stroke plug, with air cushioning if desired, to assist in the forming of the more difficult shapes.

An extra is a sandwich heater. This cuts heating times on thick sheets and is useful for the forming of materials of very low thermal conductivity such as the polyolefines.

Sequences of Operation

The extreme versatility of the Bescovac machine can be seen by examining the sequences of operations which can be pre-set and automatically controlled. The four major sequences are as follows:

Straight Vacuum Forming

This is suitable for both male and female mouldings and depths up to about 2in. The sheet is clamped into the frame, heated and the heater re-

Continued on page 354

The Bescovac fully-automatic vacuum-forming machine has a very high degree of control, and once set can be operated by unskilled labour

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Vacuum-Forming Polypropylene

JOINT DEVELOPMENTS BEAR FRUIT

A QUESTION which has been exercising minds on both the engineering and materials sides of the plastics industry is that of exploiting the merits of polypropylene in vacuum formings. One problem is the production of a truly homogeneous sheet as a starting material; another is the familiar one of economy — the achievement of a cycle-time comparable with those for materials having greater thermal conductivity and lower softening point.

The high softening point of polypropylene is one of the characteristics which gives it such marked superiority over other thermoplastics such as polythene. Telcon Plastics Ltd. have for some months been carrying out development work on the extrusion of polypropylene sheet.

Makers of vacuum forming machinery have been working on the design and production of equipment capable of providing a heating density sufficient for the needs of polypropylene and other plastics of high softening point.

The two converging lines of investigation met at Interplas this year, when Parnall and Sons Ltd. demonstrated on their stand the production of complex formings, having a 1 : 1 draw ratio, from sheet $\frac{1}{8}$in. thick in an overall time cycle of 1min. 50sec. The machine used was the Parnavac 2721 HD, the smallest of their range of sandwich heating machines.

The formings were made from Telcon polypropylene sheet, and from their uniformity, both in thickness and mechanical strength, and their surface finish, it would appear that much of the difficulty in vacuum forming the material has been overcome.

AUTOMATIC VACUUM-FORMING MACHINE

Continued from page 352

moved; vacuum is applied which forms the sheet to the mould; vacuum is turned off and cold air blown over the sheet to set it; air pressure is applied between the sheet and mould to strip the moulding off.

Drape Forming

This is suitable for formed depths up to 13$\frac{1}{2}$in. The sheet is clamped into the frame and heated as before; the mould is raised and pushed into the softened sheet; vacuum is applied and the moulding is finished as straight vacuum forming.

Drape Forming with Inflation Assistance

The sequence of operations is as for drape forming except that as the mould is raised, the sheet is blown up until an airtight joint is made between the clamp frame and drape table.

Drape Forming with Plug Assistance

The sheet is clamped into the frame, heated, and the heater removed; the plug is lowered and stretches the sheet evenly into the mould cavity; vacuum is applied, the plug is withdrawn and the vacuum is turned off; then chilling and stripping is as before.

The specification for the Bescovac is as follows: maximum forming area 25in. x 22in.; maximum depth of draw 14in.; heater capacity 6kW.; air supply required 80psi; power consumption 7.5kW.; overall dimensions 44in. x 70in. x 71in. high.

New Tile Adhesive

A new low cost synthetic rubber based tile adhesive, Cascoset 1539, has been developed by Leicester, Lovell and Co. Ltd. for bonding vinyl, vinyl asbestos, cork and linoleum tiles to a variety of surfaces. Tests carried out by several manufacturers of vinyl tiles in this country, have shown that a gallon of the adhesive will satisfactorily cover up to 30 sq. yd. at an adhesive cost of about 6d. per sq. yd.

The material is neither toxic nor inflammable. It is also claimed that it is not affected by plasticizer migration associated with vinyl tiles.

Kays New Foam Grade

Kay Bros. Plastics Ltd., a Reckitt and Colman company, is now going into quantity production with an improved grade of polyether foam.

This is Foamoprene Gold, a grade originally developed to meet specifications laid down by one of Britain's biggest furniture manufacturers.

The improved type of foam has been achieved by producing an irregular pore structure. This removes the slight surface rigidity which, from the upholsterer's point of view, has been an undesirable feature of plastics foams until now. The soft-textured feel of Foamoprene Gold makes it virtually indistinguishable in blind tests from natural latex foam.

The new foam, which has been well received by leading furniture manufacturers, meets the quality standards of the British Cellular Rubber and Plastics Manufacturers' Association and carries their circular 'hallmark'.

New Office for Commercial Plastics

Commercial Plastics Ltd., the plastics sheet and film manufacturers, announce that their marketing and administrative companies in London are now all located in Berkeley Square House, Berkeley Square, London, W.1 (telephone MAYfair 8030). This change of address affects the following companies: Commercial Plastics Ltd., Commercial Plastics (Sales) Ltd., Anglo American Plastics Ltd., Fablon Ltd., Mondart Ltd., Iridon Ltd., Thermalon Ltd.

Marker buoys for a recent regatta were made from seven layers of Marleycel expanded polystyrene, threaded on a length of pvc pipe, stuck together and shaped by hand. The completed shape was then covered with canvas and finished with Day-Glow paint

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MEN and MATTERS

A Review of People and Events

by Peter Richards

ALWAYS a firm that is willing to introduce new methods and not afraid to take what at first sight appear to be rather unconventional moves, Vitafoam Ltd. is to install a semi-automatic bookkeeping machine early next year.

This machine is a specially modified National Post-Tronic machine and will be the ,first of its kind to be used outside banks. It will enable Vitafoam to increase the speed and accuracy of recording sales and issuing monthly accounts to many customers. At the same time it will enable them to handle the accounting for their sales while easing an acute staff shortage of skilled machine operators.

One girl, who will not require special training to operate the machine, will be able to handle all the firm's ledger work, amounting to many hundreds of items a day. In the United States, where the equipment was introduced about four years ago, over 6,500 Post-Tronic machines are used in banks and they have already been adopted by several British banks.

Cops and Robbers

In these days of short wave radio squad cars and the increasing use of electronic devices by the police for the detection and prevention of crime, it is nice to know that the humble horse is still relied upon for certain essential duties on ceremonial and other occasions. And so, just as garage space vies with cell accommodation for inclusion in the design of many of London's new police stations, provision for stabling, too, is not overlooked.

The newly completed station at Brixton, wired with over 19 miles of cables manufactured by British Insulated Callender's Cables Ltd., is a case in point; where the Station Sergeant no doubt keeps a few lumps of sugar in his desk drawer and where the stables, in that they are ventilated by independent extraction units, are on a par with the cell block, the kitchen and the drying room.

Various grades of BICC single- and multi-core cable, insulated and sheathed with pvc, including steel wire armoured cable, were used for the electrical installation, being drawn into heavy gauge screwed steel conduits and an underfloor duct system. This duct system serves all floors and carries extra low voltage current for telephones, inter-office buzzers, fire alarms, impulse clocks, distant reading thermometers and the cell call system.

Scaled Down Planning

The wide use of decorative laminated plastics in both industry and the home has tended to obscure the numerous technical and scientific applications of this material.

One of these specialized industrial applications has been devised to cut costs in the production of clothing. The principle is to reduce the size of patterns enabling more efficient planning. It is claimed that up to 4% of material can be saved by this system.

In practice, a series of normal size patterns are reduced to miniature scale models by a cutting machine. The resulting reproductions are then arranged on a planning board 6ft. by 18in., representing an area, or 'lay' of material up to 10yd. by 62in.

The 'Laymaker' Planning Board is graduated with scales incorporated in Warerite green veneer, and if necessary, can accommodate patterned materials or metric measurements.

The miniature 'lay' is then photographed, and the cutter uses the print as a guide to lay down the original full-sized patterns. This system not only saves cloth and labour, but provides a useful record of 'lays' for future reference. It has been devised by S. Littman and is being marketed by the Nelson Planning Co.

Blue Peter Changes

Sales Development Manager of Blue Peter Retreads Ltd., P. J. Kent, has left the company's service, the Midland Area Manager, B. H. T. Rowley, has become Sales Manager Earthmovers, and the South Western Circuit Representative, C. H. Repper, is now Midland Area Manager.

Dunlop for Ever?

In a television programme called 'Perpetual Motion', shown recently on Associated Rediffusion (London), the story of the development of Dunlop tyres was told.

In the 15-minute programme, Kenneth Wolstenholme traced tyre progress from those made for the early motor car to those designed for Donald Campbell's attempt on the world land speed record last year. Also highlighted was the invention of the disc brakes used on cars, aircraft and other forms of transport.

Submarine Gymnasium

How do you exercise yourself in the cramped quarters of a submarine? One captain of an American nuclear-powered submarine equipped with Polaris missiles, is quite sure of his answer — since he has installed an air inflatable gymnasium on his ship.

The gymnasium is, in effect, simply an air inflatable room that can be deflated and stored when not in

The recently completed police station at Brixton has been wired with 19 miles of pvc sheathed cable supplied by BICC. *(See: Cops and Robbers)*

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use. It is made of a rubberized fabric material.

The captain recently visited Goodyear at Akron, Ohio, to discuss the inflatable gymnasium and other inflatable and rubberized fabric equipment, including rocket liners and inflatable bunks and gangplanks for the submarine.

Back to Britain

The general manager of F. J. Stokes Ltd., the new UK subsidiary of the F. J. Stokes Corporation of Philadelphia, is James Davies. Although he is a former sales engineering executive of the American parent company, he is an Englishman. He was formerly with Mullard Overseas Ltd., and was in North America from 1953 selling British machine tools for Sykes Tool Corp. and Fidelity Machine Tool Inc. He joined Stokes in Philadelphia in 1959.

Mr Davies is operating from Mercury House, Hayes Green, Ealing. The first machine to become available in the UK through the formation of the subsidiary, is a 25-ton automatic transfer press (*RPW* July 8, 41).

This is of simplified design and is intended as a low-cost unit for short production runs where low mould costs and quick set-up are desired with labour saving advantages of fully automatic moulding. The machine illustrates one of the reasons for the formation of the UK subsidiary. Discussing this, Mr Davies said: 'With acute labour shortage experienced in many diverse industries, management is welcoming automatic machines.'

Lest We Forget

The Dunlop Memorial Hall, now nearing completion at Dreghorn, Ayrshire, will be opened in October. Dreghorn is the birthplace of John Boyd Dunlop, the Scottish veterinary surgeon who invented the first practicable pneumatic tyre in Belfast in 1888.

Members of the John Boyd Dunlop family have contributed to the cost of the hall and the Dunlop Rubber Company has also made a grant.

New Chairman for Marinite

R. H. Dent, deputy chairman and managing director of The Cape Asbestos Co. Ltd., has been elected chairman of Marinite Ltd., manufacturers of non-combustible asbestos sheet.

Sir Victor Shepheard, KCB, has joined the board of the company. He is director of research, British Shipbuilding Research Association, director of William Denny and Brothers Ltd., and until 1958 was director of naval construction at the Admiralty.

Appointments in Brief

David R. Matthews has been appointed a director of the London Asiatic Rubber and Produce Co.

* * *

Frank W. Harper has been appointed a director of Golden Hope Rubber Estate.

* * *

A. K. Chappell, sales manager of Reed Plastic Packaging Ltd. — a member of the packaging division of Albert E. Reed and Co. Ltd. — has been appointed a director of the company.

THE LEGAL ANGLE

Agency — And Holding Out

By a Barrister

'In some firms, the importance and the complexity of selling is recognized; but in others, the salesman is relegated to "the person who has to go out and collect the orders".'— RPW, July 15 1961.

We will presume that your salesmen are given proper status — and limited powers to negotiate prices and terms on your behalf. What happens if one of them exceeds the authority you have given him and enters into a deal which is unprofitable from your viewpoint? Will you be bound to accept it?

It is a basic rule of English law that third parties are entitled to rely upon an agent's authority, if that authority is either real or ostensible.

Suppose you send out your representative to sell your new lines in plastic kitchen ware. You give him samples and a price list, but warn him not to promise any fixed delivery date. Tempted by a particularly good order, he ignores your warning and agrees a delivery date, far in advance of your output.

If your salesman had your real authority to make a binding contract on your behalf, quite clearly your customer would have been able to force you to stick to the deal, just as you could have enforced the contract against him. But equally, as your representative was 'clothed with your apparent authority' to contract on your behalf, you will be bound by the agreement he has made. You have 'held him out' as having such authority — and the customer is not bound to enquire as to whether or not that authority was real.

The Agent's Responsibility

Or put it the other way round. If a man comes from a company selling injection moulding machinery, shows you his card and then proceeds to sell you certain units at certain prices, the law does not require you to check with his employers as to whether or not he was entitled to do so. They have given him their ostensible authority to sell on their behalf, and you can rely on it.

Naturally, this gives agents great responsibility. The only way to curb it is to inform your customers of its limits. 'I am sending Jones round to see you', you could say. 'He will show you our new lines — and if you will give me a ring, we can fix details about terms and deliveries'. Quite clearly, Jones cannot do it — and his powers are restricted. You have robbed him of your ostensible authority to contract on your behalf.

The moral? If you give status to your salesmen, do not expect your customers to seek out its limits.

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VIEWS and REVIEWS

French Lessons

THE June 1961 issue of *Revue Generale du Caoutchouc* (Vol. 38, No. 6) was of more than usual interest. The chief topics were: how the rubber tree makes rubber, tapping for latex, vulcanizing with peroxides, automatic hydraulic presses, and exhibitions.

The Biosynthesis of Rubber

Roger Hublin, head of the research department of the Institut Français du Caoutchouc, contributes (on pp. 904-913) a fascinating account of the present state of our knowledge of how the rubber tree makes rubber. It is a summary of the work carried out by British, American, German, Russian and other workers, with natural emphasis on the French contribution, especially that done at the Institut since Le Bras, actuated by the thought that a better knowledge of the biological mechanisms of the arboreal synthesis of rubber could lead to improvement in yield.

The paper is given in both French and English.

The author limits his review to the carbon cycle, *i.e.* the process extending from the carbon dioxide of the atmosphere to the rubber in the latex. The nitrogen cycle is also important, for it creates the proteinaceous colloids, stabilizers, and enzymes.

There seem to be four main stages in the synthesis of rubber from CO_2.

1. To glycosides, starches, sugars, hemi-cellulose.
2. To acetic derivatives.
3. To isopentenyl pyrophosphate, the immediate precursor of rubber.
4. To polyisoprene.

This is something of a simplification because the path is not exactly so straight a route as much as a meandering. There are side reactions which are essential to the orderly progress of the whole synthesis, supplying at times intermediate products, and at others the necessary energy in available form.

Enzymes and Energy

The first stage is one of photosynthesis in the presence of chlorophyll, in which CO_2 and H_2O form first a glyceraldehyde and then hexoses, some of which are stored in the plant, some are further elaborated to structural products such as cellulose, and the remainder being used for making rubber. Storage is not unimportant; a topped and leafless tree will continue to produce rubber, by 'living on its fat', for 12 months.

The second stage is highly interesting to both chemists and biologists. It is the conversion of hexose through phosphate compounds to pyruvic acid and ultimately to acetic acid. This couples with 'Coenzyme A' to form a product of remarkable properties, an intermediate which is highly reactive but the course of whose reactions is directed and controlled by the type of enzyme system operating — a sort of template.

The third stage leads to isopentenyl pyrophosphate. Thanks to the work of many researchers, the facts are now well established. Polyisoprene results from acetic derivatives — it is even possible to determine how the two carbon atoms in acetic acid are located in the final molecule.

The fourth stage is a very neat chemical process, proceeding almost all the way through phosphorus compounds. Chemists will consult the original for details and, I hope, as I was, be fascinated by the unfolding story and especially by the energy balances, the Krebs cycle, and the phosphorylation cycle. A symbolized sketch depicts all this in the form of a boiler and coupled gear wheels.

Contrast with Factory Synthesis

The whole is a polycondensation rather than an addition polymerization, in marked contrast to the man-made synthetic rubber processes. One matter still eludes the researchers: the nature of the enzymes which direct and control the polycondensation.

M. Hublin concludes his review by considering how these research results could be used to improve the output of the rubber tree. 'Should each step be checked, point by point, starting from CO_2 metabolism, or is there some master step which controls all of them?' British research has shown that IPP is 100% converted to isoprene but the efficiency of MVA conversion has been shown by the French to be not more than 15%. The central problem therefore appears to be an energy balance and especially that involved in glycolysis.

The line of further research being followed by the Institut is dictated by this conclusion but it is intended to pursue the investigations not in latex (where the presence of rubber makes isolation of the enzymes difficult) but in the production of cholesterol by the enzymology of malonic acid in the liver cells. I like M. Hublin's comment on this: 'Of course, all necessary steps will be taken to ensure that this transposition from plant life to animal life is not unduly daring'.

A Lead for Synthetics?

Printed with the paper here is a short discussion (not translated) in which the following points emerge. The work began 15 to 20 years ago and resulted in the establishment four or five years ago of the main facts presented in this paper. The elucidation of the new lines of research was really quite recent, between one and two years ago. The methods used for identifying the compounds were radioactive labelling and chromatography.

When pressed to agree that industrial chemists might profitably study this polycondensation process, M. Hublin made an interesting point. He agreed that an imitation of the biological polycondensation could produce at ordinary temperatures and pressures a stereo-regular material. 'At the same time, it is by no means certain that one ought servilely to copy nature. In order to fly, it is no longer necessary to reproduce the flapping wings of birds. . . .'

Tapping the Rubber Tree

Prof. J. G. Bouychou, who is the Head of the Agronomic Service of the Institut Français du Caoutchouc, is rewriting his 'Manual for the Rubber Planter', first published in 1954, since when there have been so

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

many improvements and developments in the cultural techniques and exploitational knowledge of Hevea brasiliensis that a complete re-writing has become necessary. The book will now begin with a chapter on tapping and the first part of this new chapter is reproduced in the June 1961 issue of *Revue Generale du Caoutchouc*, Vol. 38, No. 6, pp. 967-973. The remainder will appear in future issues of the journal.

Latex flows from the tapping cut because of the internal pressure in the latiferous vessels caused by osmosis. At first, the flow is rapid but as the internal pressure is relieved it becomes slower, and finally, after two to three hours, ceases. The cut then becomes sealed on its surface by a coagulated film of rubber.

A cut drains quite a large area of the tree and the internal pressure is related to the aqueous conditions in this area, in particular on the degree of hydration of the cells in the neighbourhood of the latiferous vessels, which, in turn, depends to a large extent on the moisture available to the tree. Abundant rain after a dry spell markedly increases the yield of latex.

An untapped tree does not need to make much rubber but a tree in tapping is thrown out of balance, an unusual part of its growing energy having to be directed to replacing the latex which is removed from it. The skill of the planter consists primarily in matching the demands he makes on the tree to its capacity to meet this imbalance and to reconstitute its latex.

The author explains by word and diagrams the effects on volume yield and rubber content of: the length and depth of the incision, the angle of incision in relation to the direction of the latiferous vessels, the height of the incision up the trunk of the tree, and the differences between a grafted and a seedling tree. He also considers the effects on the physiology of the tree of: continued tapping, ecological and climatic conditions, time of the day and period of the year when tapping takes place, seasonal metabolic changes, and mineral nutrition.

Now for Exhibitions

The ranks of industry and commerce have their own shovel-hatted puritans who are forever looking for a wap of stopping somebody doing something. I am not among them, being by temperament libertarian. Yet, I do advocate controls, some controls, that is, because we can have too much of a good thing.

We are not compelled to drown because we want to drink.

In the matter of conferences and of scientific writing I am pleading for that control which will permit us to turn off the tap and reduce the flow to drinkable proportions. In these fields, I support any move which will give us less and better.

It may be that the European Common Market will be such a move. Consider its effect on exhibitions.

During an interview reported in *Revue Generale du Caoutchouc* for June 1961, Vol. 38, No. 6, p. 897, Jean Pennel says that at the first meeting of the Comité de Co-ordination des Industries de la Transformation des Matières Plastiques de la Communaute Europeenne, it was felt advisable to restrict the number of international exhibitions in the Common Market countries. The result:

Utrecht, Holland	1960
Gand, Belgium	1961
Paris, France	1962
Dusseldorf, Germany	1963
Milan, Italy	1964

I am not sufficiently in the councils of those who decide these things to be able to say whether the one after those will be:

London, England	1965

but it looks as if there is every chance of that coming to pass. There is a lot to be said for it.

Paris in the Spring

And there is a lot to be said for another feature of the exhibition next year — plastics and rubber interests are co-operating.

'Europlastique 62' will be held in Paris from May 19-29 1962, and will be the first international exhibition of rubber and plastics ever to be held in that city. Also, it is claimed, it will be the first time there has been an association of rubber and plastics in one exhibition.

'No clear boundary can be delineated between plastics materials and synthetic rubbers, and both are often made by groups with joint interests', says M. Pennel, who for three years was chairman of the French Association for Rubber, Plastics and Related Industries, and adds, 'since both plastics and rubbers are processed by closely similar techniques, such as mixing, calendering, extruding, coating, moulding, etc.', there will be three sectors at the exhibition: raw material producers, equipment manufacturers, and rubber and plastics processors.

Good All Round

All this associating, aggregating, coalescing is good for the man who matters — today's busy executive — who would rather make one journey to see three things than three journeys to see a bit more. If it eliminates some of the camp followers, too, it is doubly welcome.

Coincident with most big exhibitions nowadays there is a conference. 'Europlastique 62' is no exception; organized with it will be 'seminars' — the official translation — in which the (French) Society of Chemical Industry, the Centre of Studies of Plastics Materials, and the French Institute of Rubber will all participate.

No details are given but it is said (for some strange reason, in the English version but not the French) that 'this activity will supply our engineers and technicians with very valuable information, since some of the best scientists and specialist research men have already agreed to participate'.

If the Common Market is importing common sense into the proliferation of exhibitions, it may yet do the same for conferences, and then, who knows, technical and scientific literature. If we become organized in these big geographical areas, there may be the chance of the universal co-ordination of information sources on which the future of technology may well depend.

CHARLES JENNINGS

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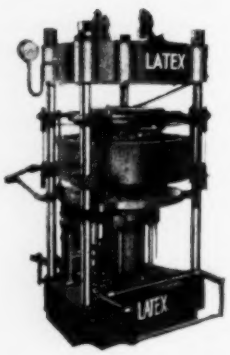

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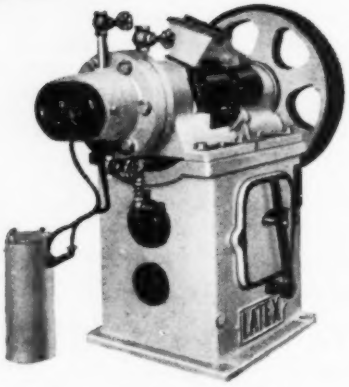

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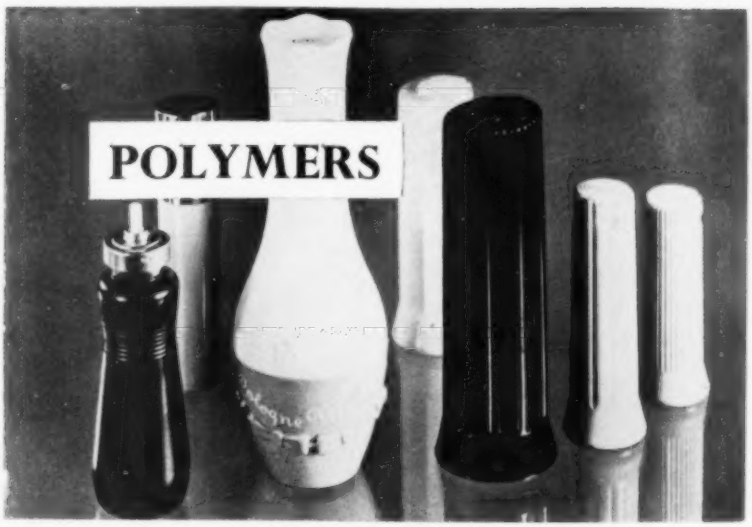

An RPW Special Feature

The Seventh International Packaging Exhibition opens at Olympia on Tuesday (September 5). Twice as big as the 1955 exhibition, the emphasis will be more than ever on plastics. This feature contains a preview of the exhibition from a plastics angle and several articles on specific packaging aspects (see below). A full report on the exhibition will appear in the September 16 issue of *RPW*.

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Top picture — Aerosol containers for cosmetic packaging, complete with moulded-in valves, made from Du Pont's Delrin acetal resin. Centre — Extruded cellulose acetate is used by Formica Ltd. to make these packs, useful for a wide variety of small articles. Bottom — Fruit and vegetables packed in bags made from BX Plastics Ltd.'s Bexthene film, extruded from Bakelite polythene

POLYMERS FOR PACKAGING

International Packaging Exhibition

POLYMERS FIND USES IN ALMOST EVERY APPLICATION

THE seventh International Packaging Exhibition, which opens at Olympia next Tuesday, will cover over 300,000 sq. ft. of floor space — more than double the area used for the 1955 exhibition. This is some indication of the rate at which the packaging industry has been, and still is, expanding and of the potential markets for polymers in this field.

Over 300 exhibitors, including some 70 from Germany, Switzerland, Austria, France, Italy, Holland, Belgium, Denmark, Sweden, the USA and Canada, will be taking part.

All aspects of packaging — machinery, materials and containers — as well as bottling and package handling, will be covered.

The European Packaging Federation, consisting of 18 member countries, will hold its annual general meeting in London during the exhibition and the Institute of Packaging, in association with the Western Hemisphere Exports Council and the Exports Council for Europe, is holding a packaging convention on consumer goods packing for export.

This will be held in four sessions as follows: September 6, Foodstuffs and Beverages — North America and Europe; September 7, Pharmaceuticals and Cosmetics — North America and Europe; September 13, Household and Store Products — North America; September 14, Household Goods and Domestic Appliances — Europe.

Plastics Appeal

Plastics and packaging are now so closely integrated that it is difficult to imagine how things were before plastics came into the field. Practically every kind of packaging can be carried out with plastics and the scope of the designers has increased immeasurably. Eye appeal for impulse buying is a major feature of modern packs and the colour range which the designer has at his disposal is almost unlimited.

Blow moulded bottles and tubes are available in a vast range of shapes and sizes, from small squeezable cosmetic and detergent packs to drums and carboys for the transportation of many chemicals and powders. The high gloss and clarity of polythene films is utilized to advantage in the rapidly expanding pre-packaging field and the use of such films for the wrapping of vegetables and bread is increasing.

Carton overwrapping is also developing into one of the largest packaging applications of polythene film as is garment wrapping by clothing manufacturers and dry cleaners. HD polythene and nylon film are widely used to pre-pack re-heatable foods and polypropylene film is

Poly-Tainer bottle in polythene supplied by the Metal Box Co. fitted with a pierceable screw cap in red urea formaldehyde

claimed in the USA to be 'the fastest growing packaging material yet'. It is predicted that in the next few years its applications will be immensely widespread and that it will replace considerable quantities of other plastics films.

Expanded polystyrene impact resistant packages for delicate instruments are becoming more widely used, the insulating properties of this material are also being utilized in the packaging of ice cream and similar products and polystyrene also finds uses in a wide variety of boxes and vacuum formed packs.

Film Grades

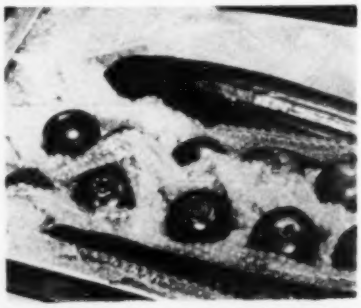
One of the best-known names in the packaging industry which is also well established in the plastics field is that of **The Metal Box Co. Ltd.** Products made by its plastics group include Diothene polythene film; Diosack heavy duty polythene sacks which are tough, moisture proof, transparent and weather resistant; Densothene high density polythene film, which is translucent and capable of withstanding extremes of temperature; and Metathene polythene-coated cellulose film. This is transparent, dimensionally stable and very strong. It is supplied in reels or pockets in a variety of grades, the print being locked between the two films.

The group also supplies laminations consisting of two or more flexible materials such as polythene film, foil and/or paper bonded by adhesives or extrusion coating.

Poly-Tainer blow moulded polythene bottles are light, combine flexibility with strength and can be adapted to puff, spray, drop or pour their contents, and other containers are supplied in polystyrene. A wide range of moulded components including aerosol valves, caps, stoppers, sprinklers, pourers and spouts are made in polythene, polystyrene, polypropylene, nylon and cellulose acetate.

Surface Coatings

The display of **Bakelite Ltd.** will show a wide range of goods packed in polythene film and blown containers and will demonstrate how this material can assist in the marketing of additional products, at present inadequately protected and often poorly presented. The canning and bottle top industries use Vinylite resins supplied by Bakelite for decorative finishes, exterior coatings and linings. These resins are non toxic,



Fablothene Airwrap polythene film provides a cushioning and display material for soft fruit

flavour free and chemically resistant and are therefore suitable for internal use in food containers. The resins are also used in lacquer form for application to aluminium foil, their

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Fablothene Airwrap polythene film, a product of Anglo-American Plastics Ltd., one of the **Commercial Plastics Group,** is an ideal material for lining display boxes for soft fruit, such as tomatoes, peaches and apricots. The air bubbles incorporated in the film act as a protective cushion and prevent the fruit from being damaged.

Packaging Adhesives

Leicester Lovell and Co. Ltd. will exhibit its range of Cascosel packaging adhesives and coatings which includes laminating adhesives, heat sealing adhesives, greaseproof coatings for paper and board, side and bottom seam adhesives for wet strength bags and multiwall paper sacks, Lemoflex pva resins used to make water soluble films and Casco ice-proof bottle labelling pastes.

Formica will show Flat-Packs, manufactured from continuously extruded cellulose acetate with pressed tops and bases, which are produced in a non-toxic grade material for small

Cellulose acetate flat-packs supplied by Formica Ltd. are used for packaging jewellery and other small items

edible goods and also for a wide variety of other small wares such as jewellery, cosmetics, dress accessories, watches, toothbrushes and stationery items.

Machinery

A recent addition to the **British Cellophane Ltd.** range of film wrapping and heat sealing devices is the BCL multi-packaging aid, designed to facilitate manual multi-packaging of cartons and other regular-shaped containers in cellophane film and specially suited to the needs of manufacturers and packers whose circumstances do not warrant the installation of automatic machinery. BCL recently introduced a new transparent film for wrapping fresh meat. This is called 3P03 and consists of a .0003in. thick polythene film extrusion coated onto 300-gauge non-moisture-proof cellulose film, and it is claimed that fresh meat wrapped in this material retains its freshness and colour longer than in any standard film.

The **Baker Perkins** Group of Companies, which includes the Forgrove Machinery Co. Ltd. and Rose Brothers (Gainsborough) Ltd., has a very large stake in the packaging and wrapping machinery field. Their exhibit will include a comprehensive display of machines, the central feature of which will be a Forgrove cut and wrap machine linked to a Rose Brothers stick wrapper, thus demonstrating the amalgamation of effort of the two companies within the group.

Materials which will be used on these machines will include polythene and polypropylene.

Polypropylene film is also one of the products which will be displayed by **British Celanese Ltd.,** who will show many current uses of Celanese film and sheet in the packaging of such varied items as gramophone records, cosmetics, pharmaceuticals, food, textiles and hardware. Other materials made by Celanese include Clarifoil, Celawrap and Cellastine acetate sheet and film, Forticel cellulose propionate moulding powder for blow moulded containers and Celatron toughened polystyrene sheet.

Dip Coating

The exhibit of **Telcon Plastics Ltd.** features Telcothene polythene coating and lamination media giving special prominence to the introduction of coatings down to .0003in. These ultra thin coatings allow economies to be effected in the coating of inexpensive papers making it possible to use them in many instances where polythene coatings have been previously ruled out by cost.

Also on view are extruded thermoplastic sheeting and powders for the dip coating of metal articles. The durable and decorative finish provided by this method is of value in display work.

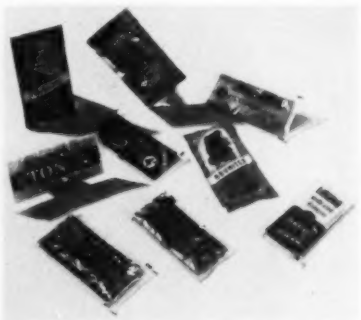
Blewis and Shaw (Plastics) Ltd. specializes in the design production and decoration of injection moulded and blow moulded packages, particularly for the cosmetic and pharmaceutical field. Bottles in sizes ranging from 10cc to 285cc with either side or top spray, jet, dropper, roll-on or powder dispensing techniques are a speciality and double-walled polystyrene cream jars with screw caps are also supplied in a standard range of sizes.

Disposable Enema

Plastics Weldings Ltd. will feature on its stand a new type of pack made up from pvc which has been developed in conjunction with Harker Stagg Ltd., as a disposable enema which is ready for immediate use and dispenses with the need for syringes, solutions, and sterilization of catheters and saves time for busy hospital staff and district nurses.

Expanded Rubber Ltd. and its associated company Expanded Plastics Ltd., will demonstrate the properties of Rubazote and Polyzote expanded materials for the packaging and cushioning of equipment.

The Reed Paper Group announced its entry into the plastics packaging field at the end of last year with the



Shampoo sachets made in British Celanese Ltd. Clarifoil cast acetate film

formation of **Reed Plastic Packaging Ltd.** At present the products manufactured by the company are confined to thin walled polythene containers for industry. These are blow moulded and range in capacity from 5 to 45 gallons. Of two basic types they consist of both open and closed top varieties and are designed for use with steel drums, fibreboard cases and drums and wire hampers. Screw caps and a variety of other closures and pourers are also available and the company operates a technical advisory service to advise on the suitability of various types of containers for specific purposes and to determine the compatibility of polythene to certain chemical products.

One of many newcomers to the field is **Planapack Ltd.,** a newly-formed packaging subsidiary of Creators Ltd. Their exhibit will include a container made from lay-flat pvc tubing with a specially designed screw-on valve cap.

POLYMERS FOR PACKAGING

Design and Decoration

MUCH DEVELOPMENT REMAINS TO BE DONE

By D. W. PRICE
The Metal Box Co. Ltd.

PLASTICS packages today are so diverse in their types that some restriction of the scope of this article is necessary. We tend to consider plastics packages under the two headings of Flexible Plastics and Rigid Plastics. The names are not entirely descriptive but the Flexible classification relates, normally to thin films or laminates from which pouches, bags and the like can be made.

Rigid Plastics, on the other hand, is a term used to describe the results of blow moulding, injection and compression moulding where the package or part of a package is the result of direct conversion from the basic raw material through the agency of a mould or die.

Naturally, some plastics laminates can be fairly rigid and some moulded products quite flexible, which only proves it does not pay to choose your terminology too early-on, in a field of rapid development. This article is mainly concerned with rigid plastics, and the limitations and scope of their printing and decoration as packages.

The impact that moulding and particularly blow moulding, has made upon the package designer, is considerable. Usually, except for glass, he has been restricted to plain cylindrical shapes, or at best something geometrical which can be fabricated from tinplate sheet or carton board. Now the situation has changed and blow-moulding allows a variety of design hardly seen before, except at the potter's wheel.

Automated Production

At the same time and perhaps because of the relative infancy of plastics compared with metal and carton board, the package designer meets his greatest challenge to ingenuity. He must make the best of printing processes he hardly need have considered seriously a few years ago. This springs from the fact that in spite of the continuous chemical processes, automated almost to the limit, which are producing plastics raw materials, as soon as the material becomes a package, its subsequent phases of production slow to a comparative walking pace. Each article must be picked up individually (perhaps mechanically) and passed through a printing process one at a time. Contrast this with a modern gravure printing machine dealing with paper from a reel and applying six or eight colours at 400ft. per min. — quite commonplace today.

Let us examine the package types and components one by one and see how they can be handled by available printing techniques.

Blow Mouldings

This is not the occasion to discuss the blow-moulding technique itself. Suffice it to say this is the method used to produce plastics bottles, now the accepted pack for liquid detergents and making iconoclastic attacks on packers of established products.

This is an article by one concerned with package design but a word of sympathy for the printer will not be amiss. Consider the poor fellow, confronted for the first time with a low density polythene bottle which is soft and pliable, has a surface to which ink will not adhere and has no positive contour on which to locate for colour registration. Can we really be surprised that he cannot, immediately give us a full-colour half-tone reproduction. The printer has been a good many years bringing rotagravure and offset lithography to its present advanced state but there we let him pursue his art on flat sheets or a continuous web in order to achieve today's results.

Ink Adhesion

Before the printer can get anywhere he must make the ink stay on the plastics surface. On polythene this turns out to be reasonably easy. Choice of ink is important and fairly quickly the designer has been presented with a range of colours sufficient for many needs. Some treatment of the polythene surface helps to keep the ink on. A rapid passage of the plastics surface under a flame is sufficient to oxidize the surface layer and make the polythene receptive to ink so that it will stay on after drying.

Before the bottle can be subjected to the pressure necessary to deposit a printed image, it must be made to behave more like a solid object, with some rigidity. This too can be achieved, by pumping it up with compressed air so that it presents a relatively non-yielding surface. The fact that a cylindrical plastics bottle becomes slightly barrel-shaped when pressurized does not cause too great a difficulty.

The problems of register between

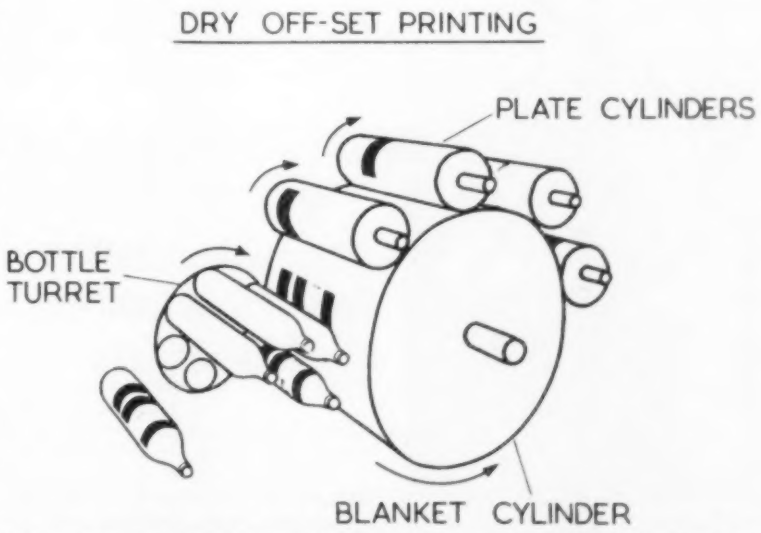


Fig. 1. Diagram showing how the four colours are successively deposited on the blanket cylinder in dry offset printing. All four colours are transferred simultaneously to the plastic bottle

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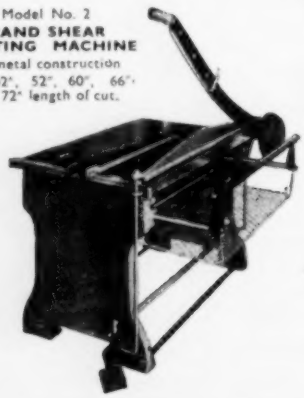

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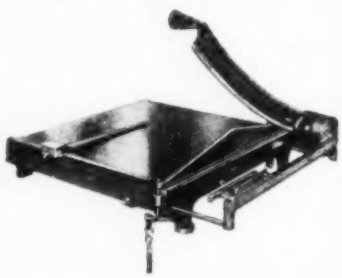

Model No. 6
BENCH HAND SHEAR CUTTING MACHINE
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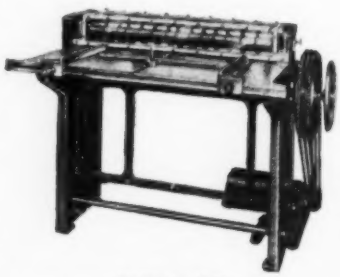

Model No. 125R
ROTARY CUTTING MACHINE
Strip Cutting sheets, Cross cutting for Squares, Oblongs, TILES. Adjustable for size. Power operation.
Sizes 25½", 32", 38", 52", 60" and 72" widths.

the colours and some feature of the bottle, can also be solved. The usual practice is to emboss a small depression in the base of the bottle so that a projecting locator or latch on the printing machine can locate accurately within it.

Dry Offset Printing

All of the measures described above are taken when dry offset methods of printing are employed. The dry offset method is so-named because of its mechanical similarity to offset lithography whilst not employing water as an inhibiting agent for the greasy ink. In dry offset printing a separate metal printing plate is used for each colour in the design. Each plate, and there are usually four available on each machine, has its own ink supply, thus permitting up to four colours to be printed (see Fig. 1).

The plate has much in common with a letterpress printing block and when the machine is in motion each

Fig. 2. An example of dry offset printing in three colours on a white polystyrene injection moulding

plate conveys its pattern in printing ink on to a rubber blanket, wrapped tightly around the printing cylinder. The plastics bottle is brought into contact with the rubber blanket which causes it to rotate and transfers the four colours of ink to the bottle surface. This happens during only one revolution of the bottle. The four printing plates transfer their images to the blanket within an area of the blanket equal to the printed area of the bottle. Although each colour is transferred to the blanket separately, all the colours are transferred from blanket to bottle simultaneously. If we stop the printing machine and examine the printing blanket we see an exact full-colour replica of the bottle surface design, except, of course, that all the words are back to front. In this fact lies a difficulty the designer must contend with.

Colour Overlap

If the bottle surface design requires two quite different colours to appear side-by-side, a small gap must be left between them. If not, there might be an occasional tendency for them to overlap, due to the normal, unavoidable slackness and errors in the machine which cause misregister. If, for example, a dark blue area tends to overlap a bright yellow area this might not be too serious on the actual bottle surface. It implies, however, that the same overlapping tendency occurs on the printing blanket. This will cause some blue ink to transfer to the yellow printing plate and vice-versa, on successive cycles of the machine. The trouble doesn't stop there. The system of feeding ink to the printing plates is similar to an offset lithographic machine, namely a series of ink rollers rotating and reciprocating against each other. Some of the blue ink can get carried right through the system, back as far as the yellow ink duct. The same thing can happen with the yellow ink on the blue ink rollers.

The effect of this is soon noticeable on the printed bottles as they come from the machine. Both yellow and blue areas will become slightly green and the only cure is to stop the machine and clean the ink feeding systems completely.

This is why, on most polythene bottles printed by dry offset, the colours are surrounded by narrow unprinted areas. Unless this precaution is taken, bad colour variation may result, together with frequent machine stoppages.

It is important to remember that much of this trouble is due to the base material being non-absorbent. The plastics bottles leave the machine with the ink still wet. For the very same reason, superimposition of half-tones is not practicable using the dry offset process.

After printing, the ink is dried by hot air in a conveyor oven. This seems elementary enough until we realize that the bottles themselves are made of a thermoplastic material.

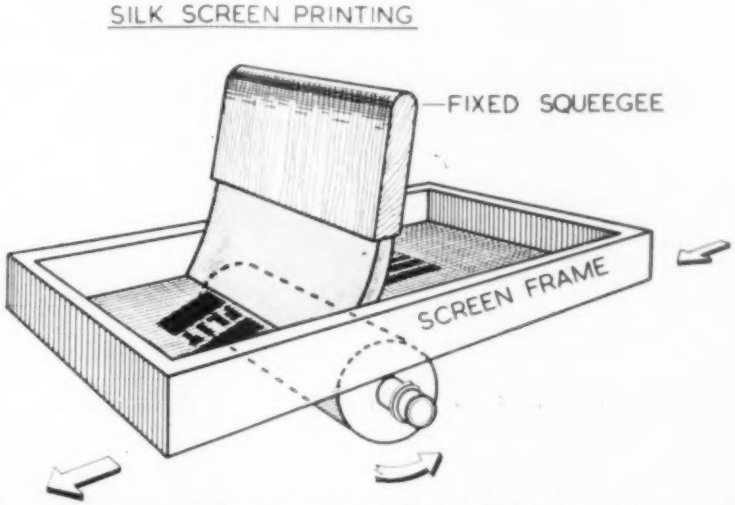

Fig. 3. The screen printing process showing the principle of printing a round bottle by semi-automatic methods

Some distortion of shape and change of bottle volume is unavoidable during the ink drying process. This distortion must be predicted and allowed for in advance if the finished bottle is not to look unsightly, or shrink too small to hold all of the intended contents.

Screen Printing

Screen Printing (once called Silk Screen Printing) is popular as a means of decorating plastics bottles. The ink image to appear on the package is defined by the holes in a fine screen or mesh of woven threads. The

Fig. 4. These screen-printed bottles have green and red on the front, and black on the back, necessitating three passes through the printing machine and drying oven

remainder of the screen is impregnated with a suitable material, often gelatine, which fills the holes and prevents the passage of ink.

In use, the screen is placed against the bottle surface to be printed and the face of the screen distant from the bottle is flooded with ink. A rubber squeegee is passed across the inked side of the screen forcing ink through the open pores, so as to colour the required image on the bottle surface.

Since the screen is slightly elastic, the method can be used as a simple method of hand printing, on surfaces having a large radius of curvature. If the screen is pressed against such a surface it tends to conform to it and a single pass of the squeegee with the screen and bottle fixed is enough to lay down one colour of a surface design.

On bottle shapes where the radius of curvature, or large area to be printed, will not permit the screen stretching method to be used, another system must be employed. In such cases the bottle is caused to roll against the screen whilst the squeegee makes its traverse of the inked side of the screen, in unison (see Fig. 3). This clearly calls for some mechanical control and screen printing machines capable of this kind of operation are not only available, at quite low cost, but are improving rapidly.

As with dry offset printing, the plastics bottle must be dried; but in this case the drying must occur after each colour, since only one colour can be laid down at each printing pass. This causes even greater heat distortion problems, apart from causing the cost of screen printing to be higher than dry offset. Compared with dry offset, the increased amount of handling, comparative slowness of screen printing machines and short life of screens causes this to be a rather expensive process for multi-colour work. The density of ink and fine detail possible, does, however, justify it in many cases.

Hot Transfer Method

Another printing process which is new to this country holds much promise for the future. This is a hot transfer method which is quite different in principle to those so far considered. The 'printing' is, in fact, done at some distance in time and place from the actual decorating of the bottle. A strip of coated paper is first printed by a rotagravure process and wound into a reel for storage and transport if necessary. The printed design can be transferred, from paper strip to bottle surface, by a machine designed for the purpose. Heat, applied to the paper on the side distant from the bottle, activates the coating on the opposite side, which carries the printed design. The printed image is thus released from the paper strip and can be caused to adhere to the bottle surface by light pressure between bottle and paper (see Fig. 5).

This ingenious process seems likely to be able to exploit the advantages in reproduction which are a feature of gravure printing, whilst coping with bottle shapes so far printed only by silk screen methods. On the other hand, origination costs may be high, as they often are with rotagravure. The hot transfer method seems destined for use on long runs, requiring high quality multi-colour printing.

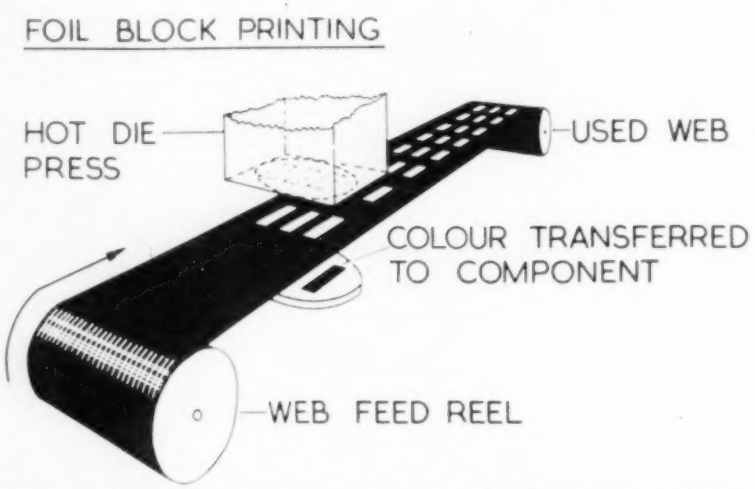

Fig. 6. Foil block or hot die printing. The web or foil moves horizontally and the die reciprocates vertically and impresses the colour on to the rigidly supported plastic component

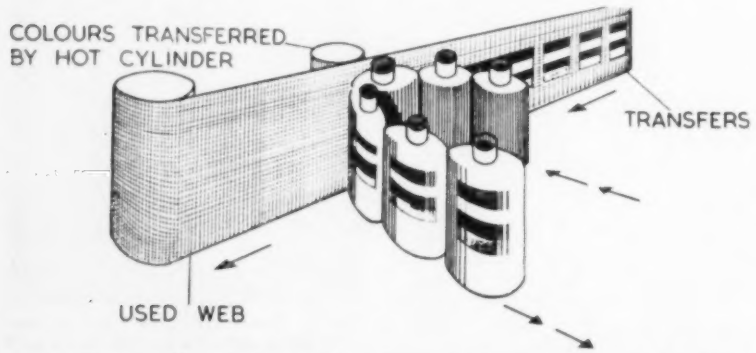

Fig. 5. Hot transfer printing consists of transferring a gravure printed image to the plastic container

Injection Mouldings

Injection mouldings can frequently be printed by methods used for blow mouldings. The dry offset and screen printing techniques are frequently employed. As a generalization the dry offset process is most suitable for decorating round plastics tubes such as are used for deodorant creams or round tablets. This is particularly true for long runs of multi-colour printing.

The versatility of the screen process can cope with areas of convex curvature, provided that projections from the surface of the moulding do not interfere with the screen's contacting the surface to be printed.

Foil Block-Printing

Other methods are, however, available. It is frequently the case that an injection moulding is to be used as a cap or closure for a container. Then it is usually the container, be it glass, plastics or metal, which carries the main decoration, designed to catch the eye of the shopper. Usually, all that is necesary on the cap, is a single colour design which merely repeats the brand name or borrows some feature of the container's main surface design, so as to make the cap look at home on the bottle.

In such cases, foil block (sometimes called 'hot die') printing can be used. This is very similar, in principle, to the common typewriter. The mould-

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POLYMERS FOR PACKAGING

Foamed Plastics

PACKAGING MARKET AS YET VIRTUALLY UNTAPPED

D. C. MILES, API.
Shell Chemical Company Ltd.

THE present estimated consumption in this country for plastics as packaging materials is 40,000 tons. In sterling this is worth around £8m. and is increasing so rapidly that it will undoubtedly soon reach the £20m. mark.

At the present time the consumption of foamed plastics represents only a small percentage of the above figure as can be seen from the fact that the most widely used foam plastics material in the UK for packaging, namely foamed polystyrene only contributed around 50 tons for the year 1960. Packaging applications of foams are developing at a very fast rate and it is believed that these materials will soon take their fair share of the very big business that the packaging industry has to offer.

Terminology

The terminology of these materials has not been generally agreed and many authoritative bodies still differ in their approach to the subject. Designations that are in common use are foamed, expanded or cellular plastics. For this article let us consider all these materials as foamed plastics under two headings; closed cell foams which as the name implies consist of discrete minute cells fused together, and open cell foams in which the cells are interconnecting. These two main types can be further sub-divided into rigid and flexible foams. A schematic representation is shown in Table 1.

TABLE 1
Foamed Plastics

Open Cell

Rigid	Flexible
Microporous pvc and Polythene	Rubber latex foam
	Pvc foam
	Polyurethane foam

Closed Cell

Rigid	Flexible
Polystyrene foam	Pvc foam
Pvc foam	
Polythene foam	
Urea formaldehyde foam	
Polyurethane foam	

Production of Foams

There are basically three main methods of producing foams. These are:

(a) Direct incorporation of air at normal pressures into a liquid mix. This is normally accomplished by whisking the material rapidly which, of course, introduces air. Examples of foams that can be produced by this method are natural rubber latex foam, styrene/butadiene foam and urea-formaldehyde foam.

(b) Production of gas formed *in situ* either by using a chemical blowing agent (such as azo bis isobutyronitrile, azo dicarbonamide or benzene sulphonyl hydrazide, etc., which when heated above their decomposition temperatures liberate a gas) or by virtue of the chemical reaction taking place during the curing reaction. Examples of foams prepared by using chemical blowing agents are phenol/formaldehyde and pvc foam. Polyurethane both flexible and rigid are examples of the latter method.

(c) Dissolving gases or low boiling liquids in the polymer under pressure. Examples of foams produced by this method are polystyrene and pvc foams.

Other methods that are also used are: The incorporation of hollow spheres into the plastics matrix as in the production of syntactic foams; the addition of soluble solids to the plastics material by mixing the plastics material with salt or starch which then can be dissolved away to produce voids. Microporous pvc and polythene are examples of this process.

Physical Requirements

The property that is of interest in the packaging of delicate materials with a cushioning requirement is that of the energy absorption/deflection characteristics. A great deal of work has been carried out on this subject and the conclusions that have been drawn are that for packing purposes it is advisable to have a straight line relationship between energy absorbed and deflection. A typical energy absorption figure for foamed polystyrene of density 1–1.25lb. cu. ft. has been reported as approximately 29in.lb./cu. in.

Adequate protection can be achieved by using many materials but in some instances quite a high thickness of material must be used to provide sufficient protection. The use of foam plastics cuts down on the thickness that would normally be required if conventional packaging materials were to be used. (See Table 2.)

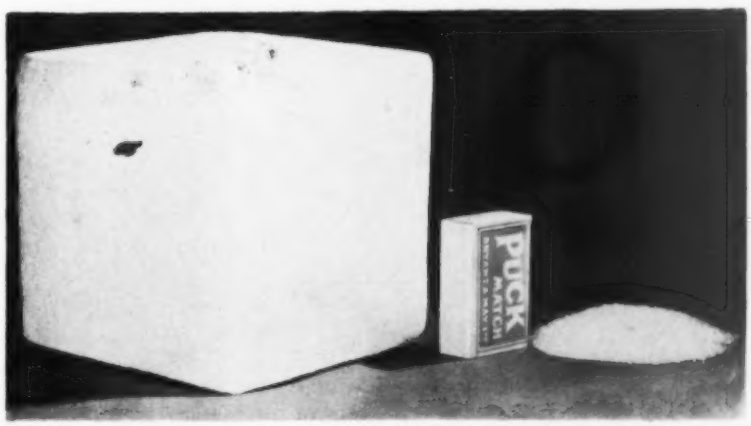


Fig. 1. The considerable expansion which takes place during the production of foamed polystyrene is illustrated by this block of foam and the small heap of beads necessary to produce it

Costs

A very important consideration in the choice of a material to be used in the packaging industry is that of

a competitive price. The industry being highly competitive, it is of little use offering a replacement material which may be better than the conventional material if the price is very high.

Realistic prices for foamed plastics are rather difficult to obtain but the price per unit volume is normally the most important consideration. Price conditions may be broken down as follows: (1) Cost of basic polymer; (2) cost of manufacture, including expansion, foaming and finishing operations; (3) minimum attainable density; (4) minimum density for the required performance without adverse effect on other properties.

TABLE 2
Typical Thickness of Materials Required to Achieve Adequate Safety in Packaging

Material	In.
Foamed polystyrene (density 1lb./cu. ft.)	1.0
Foamed polystyrene (density 2lb./cu. ft.)	1.3
Cellulose wadding	2.5
Felt	2.8
Sponge rubber	3.0
Cotton wool	3.5

Thus a polymer which can be foamed to give a material of a very low density but which will give the required performance, can have a high cost per unit weight yet still be competitive. The attainment of low densities is, however, of little use if the performance of the foam is unsatisfactory. This can best be illustrated by taking as an example a high cost per lb. flexible polyurethane which is competitive with natural rubber foam due to its high performance at low densities.

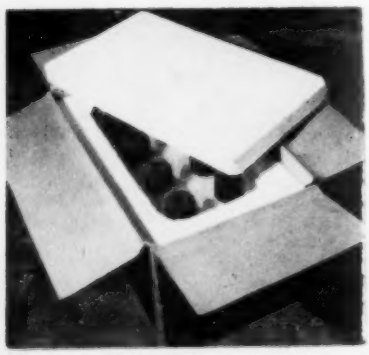


Fig. 2. Biological specimens were transported from Mont Blanc to London in these polythene bottles packed in expanded polystyrene

Phenol and urea formaldehyde foams can reach very low densities at quite low cost and yet they are still barred from many applications due to their poor physical properties.

Table 3 provides a guide to the comparative cost of various foamed plastics based on foamed polystyrene having a density of 1lb./cu. ft. The price of this material has been taken at an average price of 6s. per cu. ft. and the figures are thus based on cost per cubic foot of foamed material. It must be emphasized that these figures are approximate ones and average values only are given.

This article will deal mainly with the foamed plastics which are considered to have the largest potential as foams for the packaging industry. These materials are the polyurethanes, foamed polystyrene and lastly although perhaps not as important as the first two materials, mention must be made of foamed polythene.

Polyurethanes

These materials are formed by the reaction of a polyester or polyether polyol with an aromatic di-isocyanate. By varying the polyol it is possible to obtain a flexible or rigid foam but it is out of the scope of this article to go into the chemistry of such reactions.

TABLE 3
Volume Cost of Some Foamed Plastics

Foam Material	Volume Cost Ratio
Polystyrene	1
Urea-formaldehyde	0.6
Phenol-formaldehyde	1.5
Polyurethane (rigid)	2
Polyurethane (flexible)	2.5
Polyvinylchloride (rigid)	3
Polyvinylchloride (flexible)	5
Natural rubber latex	6

There are two techniques currently in commercial use for making the polyurethane foam. The most widely used method is by the formation of a 'prepolymer' which is subsequently reacted with water, catalyst and other materials to obtain the final formed product. The second technique is known as the 'one-shot' process in which all reactants are mixed together and the foam produced in one stage.

One of the outstanding properties of polyurethane foam is its resilience, another is its ability to be foamed *in situ*. This material is at present fairly expensive and this has somewhat limited its development in the consumer packaging industry, although it is now being used quite extensively for the packaging of industrial articles. Typical examples are electric equipment, explosives, cutlery and typewriters. The possibilities of this material are virtually unlimited and it can be coloured and does not pick up dust by static attraction.

The size of the total polyurethane market in the UK for 1960 was around 10,000 tons, being 8,000 tons of flexible and 2,000 tons of rigid foam. Only a very small percentage of this was for packaging but reliable sources have estimated the future market for polyurethanes to be around 35,000 tons by 1965. It is certain that polyurethanes for packaging applications will help to increase the present-day figures.

Development of polyurethane foams for packaging is thought to be more advanced in the USA and the following figures give some idea of consumption of this material for packaging applications in that country. In 1958 consumption was 1,600 tons, in 1959 2,600 tons, and in 1960 3,300 tons. The consumption in the UK is considerably lower but it is expected that this gap will be narrowed in the future.

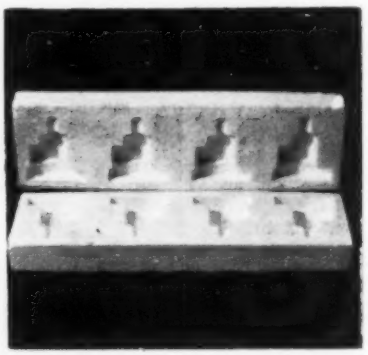


Fig. 3. A protection pack with recess cavities moulded in Styrocell expanded polystyrene

Foamed Polystyrene

This material was first made in the UK as early as 1943. There are two basic methods for manufacture. (a) A volatile blowing agent and other minor chemical constituents may be added after the bulk or suspension polymerization of monomeric styrene, and (b) a liquid or gaseous hydrocarbon blowing agent may be incorporated into polystyrene beads. This is accomplished by allowing the blowing agent to diffuse into polystyrene beads in water suspension in a sealed vessel for several hours.

The expandable or foamable beads so formed are heated in boiling water or steam causing the blowing agent to expand and the polystyrene, which is thermoplastic, to soften. As a result the beads expand, the degree of expansion, and hence the density being governed by the temperature and duration of heating. The beads normally expand to 40-60 times their original volume.

After this pre-expansion the beads are allowed to mature for a given period and they are then placed in a mould and heated by water or steam to give a final expansion. A completely coherent mass is obtained, the individual beads having lost their identity. The degree of expansion of foamed polystyrene is illustrated by Fig. 1 which shows a block of foam

and the quantity of beads necessary to produce it.

The packaging market for foamed polystyrene is at present very much in its infancy even in the USA where approximately 5,000 tons of foamable beads were used in 1960 for packaging. This material is very attractive in appearance and extremely light. In addition to these properties its low thermal conductivity coefficient, good shock absorption and fairly high rigidity render it particularly suitable for many packaging applications.

Foamed polystyrene has a very big potential in the packaging industry and already extensive use of the material is being made in the USA and Germany for the packaging of delicate instruments such as cameras, light exposure meters and various pieces of optical equipment. It has been found that even after rough handling breakages are cut to a minimum.

Another interesting packaging application that has been reported in the USA is that of combining the use of foamed polystyrene with corrugated cardboard, cardboard cartons and wire wound boxes. Foamed polystyrene inserts combined with corrugated cardboard have been used for many applications and it has been reported that not only is the cost reduced but also weight and volume space required in storing are reduced.

TABLE 4

Property	1lb. cu. ft. Nominal Density	1½-1¾lb. cu. ft. Nominal Density
Compressive yield strength ..	12lb. sq. in.	36lb. sq. in.
Flexural strength	25lb. sq. in.	45lb. sq. in.
Impact strength	0.55in.-lb. in. unnotched	0.70in.-lb. in. unnotched
Water vapour transmission (temperate conditions, all faces cut)	< 2.0 grains hr. sq. ft. in./in. Hg.	< 2.0 grains hr. sq. ft. in./in. Hg.
Maximum permissible temperature for continuous use ..	75 C.	75 C.
Coefficient of linear thermal expansion	7.2×10^{-5}/C.	7.2×10^{-5}/C.
Water absorption % by volume (all faces cut)	< 2.0% after 7 days' total immersion at 20 C.	< 2.0% after 7 days' total immersion at 20 C.
Power factor at 1 megacycle ..	0.0001	0.0001
Permittivity at 1 megacycle ..	1.02	1.04
Tensile strength	32lb. sq. in.	32lb. sq. in.

The use of a moulded shape combined with a wire wound box has also been introduced in the USA in the packaging of acid carboys and it is anticipated that this type of use will be extended to many other glass applications.

Foamed polystyrene as core material in a laminate with stiff brown paper or cardboard has appeared in the USA and offers greatly increased wet strength with excellent insulation and enhanced cushioning properties over conventional materials.

The disadvantages of this material include only fair compression recovery and when crushed there is a tendency for some of the cells to be ruptured and the material will not completely return to its original dimensions. However, foamed polystyrene has good compressive and flexural strength properties and this will protect a component if dropped.

Table 4 lists some typical properties of Shell Chemical Co.'s Styrocell foamed polystyrene.

This material is an excellent insulant retaining its properties at subnormal temperatures. Packaging applications where insulation is important include containers for ice cream cartons and date boxes. Another application that has utilized the insulating properties of foamed polystyrene is that of the recent medical expedition to Mont Blanc. Biological samples taken on Mont Blanc arrived at Middlesex Hospital in their solid frozen state. This is illustrated by Fig. 2 which shows the samples contained in polythene bottles packed in Styrocell.

Recent Developments

There are some companies in the USA who are extruding foamed polystyrene paper for greaseproof insulating wrappers and for a variety of vacuum forming applications. Extruded polystyrene foam has several major qualities to offer. Most significant are insulation and low cost. There are many packaging applications which are ready markets for utilizing the insulative properties of this foam material. One very important application is the laminating of a band of thin material to a paper drinking cup to provide insulation against the heat of hot tea, coffee and other hot liquids. The many applications for this new material are increasing rapidly in the USA and one manufacturer has introduced a wide variety of thin sheets of extruded foamed polystyrene to be used for decorative overwraps and other wrapping applications. This material may be embossed, metallized and otherwise treated to give it some significant novelty in the wrapping field. Vacuum forming of this material can also be expected to provide new applications such as disposable cups, plates and other kitchen ware.

An application that has aroused some interest for this material in the UK is that of egg boxes. The extruded paper if thick enough could be vacuum formed to give the conventional shape of egg boxes. The present egg boxes are manufactured from papier mâché, and although this material is exceedingly cheap it is far from ideal for this application as its wet strength properties are poor and it is unattractive in appearance. It has been estimated that 12,000,000 of the half-dozen capacity egg boxes are used each week representing a possible off-take of over 5,000 tons of foamable polystyrene for one specific application.

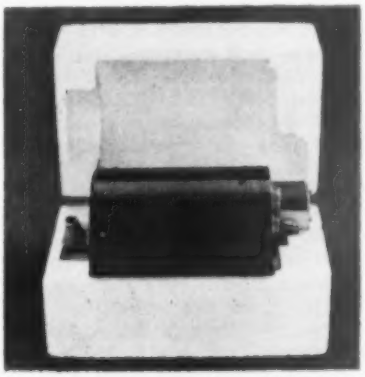


Fig. 4. Heavy expensive oscillograph unit in a moulded protective pack

Foamed Polythene

This material may be produced by dispersing a blowing agent throughout the polymer and then heating the polymer and thus foaming by the liberation of the gas from the blowing agent.

One of the interesting uses for polythene foam is in the field of package cushioning. This material has the ability to absorb shocks to a very high degree. Its high impact absorption plus the qualities of chemical inertness and non-dusting appear to make low density polythene foam an ideal packaging material.

It must be emphasized that the foam plastic market is in its infancy and will grow and grow fast. The scope of foamed plastics for packaging is almost unlimited and as existing materials are improved and others developed, so it is anticipated that further applications will be found and developed. When examining the consumption figures on a weight basis, these materials being light, high tonnage figures are not obtained. More realistic figures are those based on a volume basis and it is firmly believed that these figures will increase rapidly year by year.

POLYMERS FOR PACKAGING

Sealing the Package

BB CHEMICALS THERMOGRIP HIGH-SPEED PACKAGING SYSTEM

TWO fundamental problems have vexed our packaging industry for a considerable time: how to step up its production rates and, at the same time, how to increase output with the new wrapping materials now in vogue. More products than ever before are mechanically wrapped nowadays and, with the accelerating trend towards self-service in stores, more foodstuffs are requiring high-speed, hygienic packaging. Transparent plastics films and laminates, coated papers and metal foil have been developed for this purpose but, with these contemporary materials, not a few conventional packaging adhesives are clearly limited in their performance — especially in speed of setting.

Solvent Based Adhesives

In the manufacture of boxes, cartons, paper bags and multi-wall sacks, adhesives based on animal glues, starch pastes, dextrines and silicates are commonly used. With pliofilm, cellophane, acetate, polyester and vinyl films (as well as on high, wet-strength papers) synthetic resin emulsion adhesives based on polyvinyl acetate are suitable. There is a further important group of latex adhesives based on natural and synthetic latices and lacquers in which synthetic rubber, polyvinyl acetate, nitrocellulose or other resins are dissolved in an organic solvent.

All these adhesives are normally applied in packaging by a glue-wheel or roller running in a trough of adhesive. Often, a second, relieved roller transfers the adhesive, printing a pattern on to the work to be stuck. But these adhesives, though effective, contain water or solvent which has to be removed before the permanent bond is made. Therefore, to work at high speeds, additional equipment is required to hold the joint together while the adhesive sets enough to allow cartons or bags to be handled or stacked.

Loss of Time

In a number of ways, time is wasted. Many conventional adhesives tend to gel during storage and clog the pumping system supplying the adhesive troughs. Since the troughs are open, evaporation can cause changes in the adhesive and the adhesive sticks to the sides of the containers and to transfer equipment. Again, time is lost by the trough-transfer system and in washing out equipment after use. Also, adhesives containing solvents are either inflammable, or non-inflammable but toxic. Expensive solvent is wasted in drying and additional solvent is probably needed to wash out equipment after use.

To overcome these difficulties, research chemists sought a 'hot-melt' system in which the adhesive would set by cooling instead of evaporation. An early attempt was the adoption of molten adhesives (blends of resins and polymers) applied by roller systems from heated troughs. However, large quantities of the adhesive had to be kept molten in air for long periods and oxidation charred the adhesive while the troughs became furred. Careful temperature control was needed to maintain the correct viscosity.

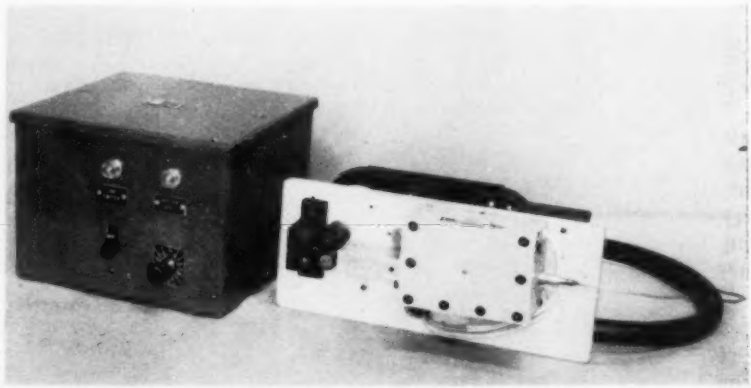
Controlled System

What packaging engineers wanted was a hot-melt system which (a) kept the minimum quantity of adhesive in the molten state at a time, (b) avoided unnecessary contact with air, and (c) delivered accurately controlled quantities of adhesive to the work at a precise temperature. These principles were incorporated into the Thermogrip Rod Cement System, developed by chemists of BB Chemical Co. Ltd., of Leicester. In this system, the adhesive is supplied in the form of a flexible, grooved rod or rope coiled into reels which is fed into a special applicator, electrically heated and thermostatically controlled at carefully selected points to hold only very small amounts of molten cement.

Designed to fit on to conventional equipment, the Thermogrip applicators replace the old glue box and no daily cleaning is called for. The operator simply switches on the current 15min. before use and switches off when the work is complete. No adhesive is wasted and the machine does not have to be stopped to replace the reels of adhesive. Applicators can be driven from the converting machine or by a separate, electric motor with a variable speed drive mounted above the unit. This facility eliminates operator control over the quantity of adhesive and permits a more reliable calculation of costs. The nozzle-type applicators available can apply a continuous ribbon of cement to a web of material, while the wheel applicator permits intermittent application of a molten bead of cement to passing objects.

Three Types

Three basic types of applicator are available: for extruding molten adhesive from a nozzle, either in an unbroken line or as an interrupted line if a valved nozzle is used; for applying molten adhesive from a small wheel fed with cement as required; and for printing transverse lines or patterns of adhesive from a heated pattern or blade which picks up molten adhesive from a roller and applies it as



The Thermogrip applicator applies molten thermoplastic cements intermittently by means of a rotating wheel to passing objects such as cartons, the bond being formed almost immediately on cooling of the cement

required. There is also an extruding hand-gun for preparing samples or for hand-sealing of cartons and certain kinds of moulding.

The Thermogrip melt cements, like all other adhesives, are formulated according to the characteristics of the surfaces to be joined, the rigidity or flexibility required, desirable bond strength, resistance properties and durability. In the packaging industry, extreme flexibility of an adhesive joint is an important quality and thermoplastic high polymer resins such as pva, polystyrene, polyamides and polythene have been the principal raw materials for these adhesives.

Numerous variations are provided by mixing polymers of higher or lower molecular weight, with or without plasticizers. Modifying agents such as coumarene or terpene resins, or butyl rubber or ethyl cellulose polymers may be included in minor quantities to alter the rigidity or flexibility of the adhesive.

Plastic Film Adhesion

Although paper, leather, fibre board and cardboard are good subjects for melt adhesives, the greatest advantages are seen on impermeable films such as polythene, vinyl resin, regenerated cellulose, cellulose acetate and Melinex. Not only do these adhesives give excellent bonds to different materials, very rapid setting and good bond resistance to water, oxidation, flexing and elongation, but their formulations can be modified easily to provide resistance to shear, peel, impact, snatch or fatigue — as required. Already, manufacturers have adapted the Thermogrip systems to their particular needs and there is no shortage of typical cases that testify to the claims made for these synthetic melt adhesives.

Faster Production

Wherever self-opening satchel bags are used for packing powders, it is possible to speed up production by using an immediate-setting adhesive in the side seam, ensuring powder-proof bags with little risk of the side-seam breaking because it is completed before the bottom is formed. In food packaging, to retain flavour in some products which must have a long-shelf life, low-moisture-vapour transmission materials such as MXXT films are used — with an appropriate sealing system.

Such are the diverse packaging problems that have been solved by 'Bostik' chemists, who are continuously improving the Thermogrip system with an increasing range of cements and ensuring that the right applicator and the right adhesive are used for each job. Without this research into techniques of thermoplastic sealing many modern packaging lines would not be running, as Thermogrip allows, at speeds approaching 1,000ft. a minute. This hot-melt system is a notable progression in the field of high-speed bonding, of major significance to the packaging industry.

DESIGN and DECORATION Continued from page 370

ing is supported and located with the surface to be printed, uppermost. A strip of 'foil' is fed, horizontally above the moulding. The strip bears, on its underside, a coating of the colour to be printed. A hot die descends, vertically, to impress its design through the strip and on to the surface of the moulding (see Fig. 6). The design which is to appear in colour must be raised or embossed on the die. The system is suitable for long runs and does not require much attention, whilst operating. The resulting design, which it is seldom convenient or necessary to render in more than a single colour, is slightly impressed into the material surface on a thermoplastic material. This is due to the action of the hot die.

Embossing

It would be unjust to omit this as a method of decorating plastics packages. It can be used quite effectively on blow mouldings, injection mouldings and compression mouldings (see Fig. 7). The beauty of the method lies in its costing next to nothing. Some extra work is entailed at the time of toolmaking in order to engrave the mould or die, but in production the additional cost over a plain moulding is negligible.

Fig. 7. A high-density polythene bottle which relies solely upon embossing for its surface decoration

A word of caution must be said, however. Because of the nature of all moulding processes, the package designer must give thought to the design of mould which will produce his design. It is in everyone's interest to keep the mould design simple. Take, for example, a common plastics tube, to be made, say, in polystyrene. The tube might be intended to carry pills or tablets and it will be made by injection moulding. Each tube would normally be ejected from its mould cavity by a straight push, applied mechanically, along the axis of the tube. Obviously, if we attempt to put embossing on the exterior cylindrical surface of the tube, extracting by this means will be impossible. To achieve embossing on the cylindrical surface imposes such complications in the toolmaking that it can hardly be justified. Printing is the obvious answer.

To combine embossing with printing is not only simple but can often be effective and striking in appearance. If the faces of embossed letters are kept flat, a simple roller application of ink will leave a deposit on the raised surfaces whilst leaving the relieved areas unmarked. Packages are on the market where this method has been used on both injection mouldings and blow mouldings.

Conclusion

Much development remains to be done in the field of printing and decorating rigid plastics for packaging, but we must give the printers credit for what has been achieved in so short a time. Whether there is a demand for multi-colour half-tone work remains to be seen. The present fashion for bold simple decoration in solid colours seems to be the desire of package users and designers as much as a result of printing limitations.

The graphic designer should not complain that there is not sufficient scope for his art but in many cases might do well to study more carefully, what can be achieved with methods already available.

POLYMERS FOR PACKAGING

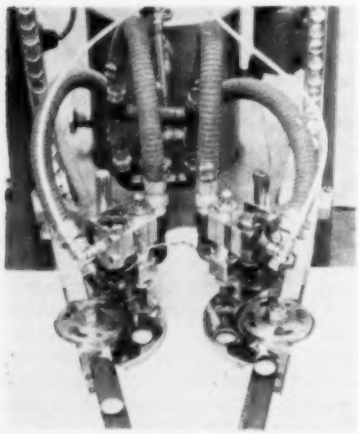
Flowed-In Gaskets

HIGH SPEED PROCESS USED TO PACKAGE A WIDE RANGE OF PRODUCTS

DEWEY and Almy Ltd., London, is a wholly-owned subsidiary of the Overseas Chemical Division of W. R. Grace and Co.

The company manufactures Darex and Daraseal container sealing compounds which have been used in increasing quantities in Great Britain for food and general line cans, caps, drum seams and pail covers, and are now finding increasing acceptance for various industrial applications including moulded gaskets for air, oil and fuel filter cartridges, seals for instrument bezels and radio and electrical components and flexible jointing for clay drain pipes.

In addition to sealing compounds, the company's products include Cryovac heat shrink packaging films, which are meeting a rapidly growing demand for food packs, Darex Nyloprint and Hi-ram textile blankets and Darak battery separators.



Automatic Crown lining machine, showing hopper feeding of shells and transfer of lined caps to the oven conveyor

A new plant has recently been opened at Park Royal, London, which will house additional research and development facilities for serving container and Cryovac customers.

Complete Sealing Process

Darex can or Daraseal cap sealing compounds, together with the application equipment designed for the purpose, combine to provide the 'Flowed-In' gasket process in which the fluid sealing compounds is automatically extruded onto a spinning component. As the component revolves a uniform track of compound is laid which after baking, provides a solid or cellular gasket with resilient qualities.

Sealing is possible against many solvents, oils and gases, and against conditions of weather, vibration, pressure, vacuum and shock.

A range of packaged foods whose caps, cans and can components are sealed with flowed-in gaskets

The 'Flowed-In' process which was originally developed for lining can ends has now been extended to a wide range of closures for metal and glass containers and many general industrial applications.

Crown Linings

The process is particularly applicable to crowns where high-speed output is essential with minimum labour costs.

After lining, the crown is passed automatically from the lining machine through an oven which converts the fluid compound to an expanded unicellular gasket having the required resilience and characteristics. Under no circumstances can the gasket fall out, as it forms a bond with the under-lining lacquer.

For tin-plate crowns, the compound is applied to the centre of the panel of the shell which is rotated to spin the compound over the entire panel which seals against the bottle finish and also prevents the panel from being scratched during hoppering, etc. On aluminium crowns, which do not require protection from scratching, an annular ring lining of compound is applied, positioned to seal against the crown bottle.

Outputs exceeding 1,000 per minute for overall lined tin plate crowns and 750 per minute for annular lined aluminium crowns can be achieved with one machine.

The process has been widely adopted in S. America, Italy, Japan, and in the USA where 700m. Daraseal overall lined tin plate crowns were used last year. The crowns are used on various beers and soft drinks and the Daraseal crown compound has been formulated specifically to meet the requirements of the brewing and soft drinks industry with regard to taste and odour characteristics, pack resistance and carbonation pressure retention.

Industrial Applications

In addition to the hopper fed, high speed fully automatic crown, cap and can end lining equipment, there is a range of low speed equipment which has been designed to meet the requirements of the motor, radio and electrical and other industries where production line speeds are lower and the components vary considerably in size and shape.

The range of Darex and Daraseal compounds include those suitable for sealing metal to metal, lap and double seams (*e.g.* cased lube oil filters), metal to glass waterproof cushion and dust seals (*e.g.* instrument cases and covers) as well as those specifically formulated to provide an oil-proof adhesive or end moulding for the pleated paper type oil, air and fuel filters.

Instrument bezels showing Darex flowed-in shock- and dust-proof gaskets made by Smiths Motor Accessories Ltd.

The compounds are nozzle applied with semi-automatic equipment having output speeds of 10-20 per minute dependent upon the size and shape of the components.

Plantation Newsletter

FUTURE FOR NATURAL RUBBER NOT SO PROMISING?

by our Malayan Correspondent

FROM KUALA LUMPUR

AN American economist, T. R. McHale, has said that it is unlikely at this stage of economic and technological development and at this stage of sunken costs, that either natural or synthetic rubber will gain complete dominance over the other.

Writing in the latest issue of the *Malayan Economic Review*, Mr McHale warned that at the same time it was also unlikely that the world's natural rubber industry would remain unscathed by the emergence of a new era of competition and its future was probably less promising now than at any time in its history.

In looking at the two products, significant differences in their average cost structures were immediately apparent, he said. Natural rubber production, for example, was characterized by heavy labour input per unit of output.

Its synthetic counterpart was characterized by low labour input and high capital equipment input per unit of output, said Mr McHale.

Natural rubber had almost no counterpart of synthetic's raw material costs, but did have relatively heavy administrative costs that were lacking in the production of synthetic.

Mr McHale said that production of natural rubber could be organized in a variety of different ways and cost efficiency could be maintained at any of a wide range of productive firm sizes.

The production of synthetic, on the other hand, involved highly indivisible costs in the form of capital equipment, and cost efficiency in production depended upon relatively large productive unit sizes and high utilization of available capacity.

Over time, therefore, Mr McHale maintained, the competitive position of natural rubber and its synthetic counterparts would depend to a large extent on the movement of key factor costs unique to each rather than common to both.

Natural One Step Ahead

However, B. C. Sekhar, a senior research chemist at the Rubber Research Institute here, has said that the competitive position of natural rubber is still one step ahead of synthetic — at least for the present time.

In a talk on 'Polymers — nature versus man', Mr Sekhar had this to say: 'Future synthetic polymers may have all the properties required, and the competition may be entirely on the basis of economics of production, but the natural polymer is so versatile that subtle modification may lead to superior properties'.

He said that most of nature's polymers had been duplicated by man. Rubber had now been largely duplicated in most of the essential characteristics using the Ziegler-Natta Catalysts. But at the same time, Mr Sekhar said that chemists were still discovering certain differences in the structural make-up of natural rubber.

'This means that synthetic chemists have still to produce the exact equivalent. If the natural rubber industry can keep up this lead given by nature, natural may always be a step ahead of the synthetic industry', he added.

Mr Sekhar, a Malayan, was the first citizen of this country to be granted permission to attend a Russian symposium last year. He represented the RRI at the international symposium on micromolecular chemistry in Moscow and delivered a paper there.

Poisonous Rubber

Mr Justice Ong, in the High Court here, has dismissed a cattle owner's claim for damages for the death of 19 cattle from sodium arsenite poisoning on a rubber estate.

C. Sathu, an Indian cattle owner, sued Hawthornden Rubber Estate Ltd., claiming negligence by the firm, its agents or servants, for the death of the cattle after straying into the estate on June 20 1959.

Mr Justice Ong said that the 'cornerstone' of Sathu's case was that the defendant owed a legal duty to him to give prior warning of the intention to spray the poisonous grass killer on the estate.

H. B. Bruce, the estate manager, had earlier testified that sodium arsenite had constantly been used on the estate; that warning signboards had been permanently put at strategic points throughout the estate; and that his staff had also occasionally given verbal warning to cattle owners and squatters nearby.

Expressing his sympathy with Sathu for his loss, Mr Justice Ong said he had to dismiss the claim because it had no merit. He said he was satisfied that for years Sathu had heeded the estate's warning and that the straying of the cattle on the day in question 'was not reasonably foreseeable'.

Tyre Factory Designer

An architect with the Dunlop Rubber Co. in London is due to arrive in Malaya within the next month to start designing the proposed $12m. tyre factory at Petaling Jaya. The design for the factory is being handled in London. However, it is likely that local consulting architects and engineers might be engaged for the structural work.

Rubber Statistics

WEST GERMANY — SWITZERLAND

WEST Germany's rubber tyre production in June picked up considerably, totalling 20,681 tons against 19,243 tons in May and 18,525 tons in June of last year, according to the Federal Bureau of Statistics in Frankfurt. This was even better than the monthly average of last year, which stood at 19,360 tons. The increased production, which is shown in the 117,949 tons for the first half of this year compared with the 114,211 tons in the corresponding 1960 period, reflects the ever-rising trend in West Germany's motor car industry.

Output of other hard and soft rubber goods during June totalled 23,817 tons against 22,663 tons in May and 22,160 tons in June of last year. In the first six months of this year it amounted to 143,304 tons against 141,119 tons in the corresponding period of last year.

Imports of natural rubber and rubber sole crepe during May totalled 10,185 tons, including 5,233 tons from Malaya, and 1,914 tons from Thailand. In the first five months of this year, imports totalled 48,519 tons, including 27,413 tons from Malaya, 5,874 tons from Thailand.

Imports of synthetic rubber during May totalled 3,858 tons, including 1,776 tons from the USA and 718 tons from Canada. In the first five months of this year they totalled 19,982 tons, including 11,439 tons from the USA, and 4,026 tons from Canada.

Switzerland

Swiss imports of rubber in July totalled 814,054 kilos compared with 1,080,183 in June and 1,557,327 kilos in July 1960, according to the Swiss Customs Directorate.

Details were as follows (in kilos):

	July 1961	June 1961	July 1960
Raw rubber ..	409,693	640,598	605,708
Synthetic rubber	281,961	386,462	814,582
Reclaimed rubber ..	41,672	5,162	2,300
Scrap rubber	80,708	47,961	134,737

Main supplier of raw rubber in July was Malaya, 403,844 kilos, followed by Italy (3,330), West Germany (1,500), and the former Belgian Congo (1,019 kilos). Synthetic rubber came mainly from the US (159,444 kilos), West Germany (47,134), Holland (35,092), and Italy (25,043 kilos), while main sources of reclaimed rubber were West Germany (20,100 kilos) and France (20,330 kilos).

Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

UNCERTAINTY has been the dominating theme among the undercurrents which have kept the parish of Throgmorton Street under a black cloud during the past few weeks. On some days just recently business has almost been at a standstill and the only thing that has been at a premium in the Stock Exchange, it seems, is seating space. The Berlin situation caused a good deal of worry and without doubt was one of the main reasons why the amber signals held shares in check. Investors who regard the business outlook as doubtful were content to do nothing pending some kind of settlement in the situation. But so far they have been disappointed. Brokers nowadays are decidedly more cautious and are reluctant to go out of their way in making forecasts. Those that I have spoken to recently seem to think that perhaps prices might go a little lower yet.

They also feel, however, that the downward drift that has been going on now for some while might soon come to an end. Despite 7% Bank Rate and the dividend freeze request of Mr Selwyn Lloyd, the general feeling is that the atmosphere must begin to show signs of brightening during the early autumn. So far there has not been a lot of selling. Overall it only takes a small amount of business either way to tip the scales one way or the other. If I had money to invest at the moment I might be taking a look at some of the leading industrial favourites, which are now standing well below their 'highs' for the year. IMPERIAL CHEMICAL INDUSTRIES, for instance, which have touched 81s. 6d., are currently changing hands at 67s. 1½d. At this price the shares offer a return of just over £4 on every £100 invested. TURNER AND NEWALL have sunk from 78s. to 62s. 6d. at which level the yield is now returned at £3 16s. %. COURTAULDS, ENGLISH CHINA CLAYS, DISTILLERS and DE LA RUE also stand out as strong candidates for anyone's money.

But for the Chancellor's plea for restraint . . . is becoming a familiar announcement which shareholders are hearing when dividend time comes around for them. AIRFIX INDUSTRIES was one company which recently said that because of Selwyn Lloyd the half-time payment would stay at 17½%. But to make good part of what must have come as a disappointment, the board is handing round free shares on the basis of 11 non-voting for every 10 ordinary or non-voting held. Turnover and profits of this plastics con-

Continued on page 379

Share Price Movements

Par Value	Company	1961 High	Low	Aug. 19	Latest
£1	A.E. Ind. Ord.	48/6	35/-	35/9	35/-
5/-	Albright & W. Ord.	29/6	22/6	23/6	23/-
£1	" " " 5% Pref.	17/3	13/-	13/-	13/-
5/-	Anchor Chemical Ord.	25/6	16/-	18/9	17/9
4/-	Airfix	59/-	34/6	54/-	57/-
4/-	" Non Voting	57/-	33/6	50/9	56/6
5/-	Andersons Rub. Ord.	—	—	3/9	3/9
£1	Angus Geo. Ord.	83/-	58/6	65/-	63/9
5/-	Ault & Wiborg Ord.	17/-	12/9	15/-	14/3
£1	Avon India Rubber Ord.	46/6	30/-	37/6	37/6
£1	" " " 6% Pref.	19/3	17/6	17/6	17/6
10/-	Bakelite Ord.	66/3	42/3	45/-	45/-
£1	" 6% Pref.	19/3	16/6	17/6	17/6
£1	Baker Perkins Ord.	59/6	40/6	46/9	47/-
4/-	Bank Bdg. Rubber Ord.	3/6	1/9	2/3	2/3
4/-	Bettix	11/9	7/6	9/6	9/3
4/-	Brammer H. Ord.	17/-	14/9	14/9	14/3
10/-	Bridge, David Ord.	60/-	28/9	28/9	28/9
5/-	Bright, John Ord.	9/6	6/9	6/9	6/6
5/-	Brit. Blting & Asb. Ord.	24/-	17/6	20/6	20/3
£1	" " " " Pref.	—	—	13/3	13/3
5/-	British Electronic Indus.	15/6	9/6	10/-	9/10½
2/-	B. I. Plas. 10% Pref.	9/9	4/3	9/9	9/10½
£1	BICC Ord.	62/6	50/3	58/3	57/6
5/-	BTR Ind. Ord.	19/9	10/-	10/3	10/3
£1	" " 7½% Pref.	21/6	19/9	20/-	20/-
10/-	Castrol Ord.	52/-	37/-	40/-	38/3
£1	Courtaulds Ord.	47/6	32/9	36/-	32/9
£1	" 5% 1st Pref.	16/-	14/-	14/-	13/9
£1	" 6% 2nd Pref.	18/3	15/9	16/-	16/-
4/-	Cow, P. B. Ord.	10/6	7/6	9/6	9/3
£1	" " 5% Pref.	14/3	13/-	13/-	13/-
1/-	Dannimac Mfg. Ord.	15/3	10/6	11/6	11/3
10/-	De La Rue Ord.	70/-	51/9	55/-	52/-
£1	" " " 3½% Pref.	10/6	9/6	10/6	10/6
10/-	Distillers Co. Ord.	41/3	31/-	36/3	35/9
£1	" " 6% Pref.	20/3	17/6	17/9	17/6
£100	" 5% Conv. Loan	£96	£90	£91½	£91½
£100	" 5½% Unsec. Loan	£86½	£75	£75½	£75
10/-	Dunlop Rubber Ord.	29/-	21/6	25/3	25/3
£1	" " 5½% Pref.	16/-	13/9	14/6	14/6
£100	" 3¼% 1st Debs.	£69	£67	£68	£69
£100	" 4½% 2nd Debs.	£79	£76	£76	£76
£1	Eng. Elect. Ord.	40/6	29/9	31/3	29/9
4/-	Ebonite Cont. Ord.	8/6	5/10½	6/9	6/-
£1	English China Clays Ord.	117/6	80/-	91/-	93/9
£1	Goodyear Tyre 4% Pref.	11/6	9/9	10/-	24/6
5/-	Greeff Chem. Ord.	37/6	22/9	25/-	25/-
10/-	Greeff Chem. 5½% Pref.	8/3	7/-	7/3	7/3

Par Value	Company	1961 High	Low	Aug. 19	Latest
4/-	Greengate & Irwell Ord.	6/9	4/9	4/9	4/9
5/-	Hackbridge Hldg.	6/9	4/9	5/-	5/3
£1	Harrisons & Crosfield Dd.	57/6	47/6	49/6	48/9
1/-	Hunt & Moscrop Ord.	2/3	1/3	1/9	1/9
£1	Imp. Chem. Ord.	81/6	63/-	70/-	67/1½
£1	" " 5% Pref.	16/3	13/6	14/3	14/1½
£100	" 4½% Unsec. Loan	£83	£76½	£78	£78
£100	" 5½% Conv. Loan	£93	£86	£86	£87½
5/-	Laporte Ind. Ord.	30/9	23/3	24/9	23/3
£1	" " 7½% Pref.	23/-	20/-	20/-	20/-
£1	Leyland & Birm. Rubber Ord.	59/3	46/3	51/3	49/6
£1	" " " 6% Pref.	18/9	15/-	16/3	15/-
2/-	London Rubber	15/6	9/6	13/6	13/3
£1	" 6% Red. Cum. Pref.	20/-	16/9	17/6	17/6
£1	McKechnie Bros. Ord.	43/-	27/-	41/3	40/6
£1	" " 'A' Ord.	45/-	35/-	38/9	35/6
£1	" " 6% Cum. Pref.	18/-	16/-	16/6	16/6
5/-	Monsanto Chem. Ord.	27/6	20/-	21/3	20/-
£1	" " 3½% Pref.	12/6	11/3	11/3	11/6
£100	" " 6% Debs.	£98	£89	£89	£88½
5/-	Miles (H.G.) Hldgs. Ord.	7/9	7/-	7/6	7/6
2/-	Movitex	—	—	5/3	5/3
£1	North British Rubber	21/3	12/-	13/-	13/-
5/-	Northwestern Rubber	13/-	9/-	12/-	12/-
5/-	Plastic Enginrs. Ord.	40/-	28/6	30/-	29/-
10/-	Projectile & Eng. Ord.	50/6	22/6	34/-	33/-
5/-	Redfern Holdings Ord.	3/9	2/9	3/-	3/-
2/-	RFD Ltd. Ord.	6/3	3/6	4/9	4/6
£1	" " 5½% Pref.	15/-	11/3	11/3	11/3
2/-	Rubber Imp. Ord.	6/3	3/3	4/3	3/9
2/-	" " 'A' Ord.	5/-	2/6	3/3	2/9
£1	" " 5% 1st Pref.	13/3	11/3	12/3	12/3
5/-	Rubber Reg. Ord.	18/3	14/6	14/6	14/6
4/-	Shaw Francis Ord.	24/6	14/-	14/-	14/-
£1	Shell Ord. (Reg.)	140/-	108/-	122/6	117/6
2/-	Silentbloc Ord.	10/6	8/3	9/-	9/-
5/-	Storey Bros.	46/-	34/-	34/-	34/-
2/-	Sussex Rubber Ord.	2/7½	1/9	1/9	1/9
5/-	Sutcliffe Speak Ord.	18/6	12/6	12/6	12/6
£1	Tootals	35/6	28/-	28/6	28/-
£1	Turner & Newall Ord.	78/-	55/-	65/6	62/6
£1	" " " 7% Pref.	21/6	19/-	19/6	19/6
5/-	Universal Asbestos Ord.	27/-	20/-	20/3	22/6
£1	Venesta Ord.	76/-	61/-	63/-	62/6
5/-	Viscose Dev. Ord.	16/3	13/3	13/9	13/9
5/-	Warne W. (Holdgs.) Ord.	21/6	14/9	18/9	18/4½

Rubber Markets

LONDON

After moving up in unison with rising Eastern levels, prices lost an advance of a ½d. per lb. Short covering featured the market. Dealers took fair quantities of first-hand offers for shipments over the whole of 1962. The market was thin, however, and sellers mostly remained reserved.

Latest prices are as follows:

No. 1 RSS Spot: 25⅜d.-25⅝d.

Settlement House:

October 25½d.-25¾d.

November 25⅝d.-25⅞d.

December 25⅝d.-25⅞d.

October/December 25⅝d.-25⅞d.

January/March 25⅞d.-26d.

April/June 25⅞d.-26d.

July/September 25⅝d.-26d.

No. 1 RSS cif basis ports:

September 25⅝d.-25⅝d.

October 25½d.-25⅝d.

Godown:

September 86½ Straits cents.

LATEX

Centrifuged 60% latex per gallon in drums, seller, September, October, 14s. 7d., cif European ports. Spot, seller, 15s. 1d. Bulk, seller, d.w. 14s. 8d. Normal, seller, September, October, 11s. 5d.

NEW YORK

The New York rubber market ruled as under on August 28:

DEALERS' PRICES

US cents per lb., ex-dock

	Aug. 28	Previous
No. 1 RSS, Sept.	30 b–30¼a	30¼b–30½a
Oct.	30p	30 b–30¼a
No. 2 RSS, Sept.	29½b–30¼a	30¼b–30⅜a
Oct.	29½b–29⅝a	29⅝b–30¼a
No. 3 RSS, Sept.	29½b–30a	30b –30¼a
Oct.	29½b–29⅝a	29⅝b–30a
No. 1 RSS, Spot	30¼n	30⅜n
No. 3 amber blanket crepe, Sept.	27n	26⅜n

FUTURES — REX CONTRACT

	August 28	Prev. Close
Sept. ..	30.25b–30.40a	30.20b–30.50a
Nov. ..	30.10b–30.25a	29.95b–30.30a
Jan. ..	30.00b–30.20a	29.85b–30.20a
March ..	29.90b–30.15a	29.80b–30.00a
May ..	29.90b–30.15a	29.75b–30.00a
July ..	29.90b–30.15a	29.75b–30.00a
Sept. ..	20.90b–30.15a	29.75b–30.00a

Sales: One. Tendency: Steady.

Rubber futures were very lightly traded on August 28 and prices eased slightly in early trading due to lower overseas advices. Later, however, the market recouped slightly but there was no particular feature to dealings. In the physical market, small local dealer business was reported on a landed basis but the factor off-take was negligible.

SINGAPORE

After a slightly higher opening on August 28 the market declined somewhat under profit-taking but, at the lower level, improved interest developed and sellers backed away. Thereafter, prices fluctuated within narrow limits in quiet trading. After an early hesitant opening in the afternoon, the market eased on continued selling. Buyers backed away and, as sellers followed, the market finished at the day's low on an easier note.

Malayan cents per lb., fob Malayan ports to open ports

	Aug. 28	Prev. Close
No. 1 RSS, Sept. ..	88¼–88½	88⅜–88⅝
Oct. ..	88½–88⅞	89 –89¼
No. 2 RSS, Sept. ..	87⅞–88¼	88 –88⅜
No. 3 RSS, Sept. ..	86⅝–87⅜	87¼–87⅝
No. 4 RSS, Sept. ..	84¼–85	84½–85¼
No. 5 RSS, Sept. ..	77⅜–78⅛	77⅝–78¼
No. 1 RSS, Spot ..	87½–88	87⅝–88⅛
No. 3 blanket thick remilled crepe, Sept.	79 –80	78½–79½
No. 1 fine pale crepe, Sept.	99 –100	98 –99
2X thin brown crepe, Sept.	77⅞–78¾	77¼–78¼

Tendency: Easier.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob, at 173.60d. per gallon.

AMSTERDAM

The Amsterdam rubber market ruled as under on August 28:

Guilders per kilo

No. 1 RMA	Aug. 28	Previous
August	Deleted	2.42
September	2.42	2.42
October	2.42	2.42
November	2.42	2.42
December	2.42	2.42
October/December ..	2.42	2.42
January	2.42	—

Sales: Nil. Tendency: Steady.

DJAKARTA

Rupiahs per kilo

	Aug. 28	Previous
Spot No. 1 Priok ..	36.50b	36.25b
Spot No. 2 Priok ..	35.50b	35.25b
Spot No. 3 Priok ..	34.50b	34.25b
No. 1 fine pale crepe, Spot	33.75b	33.75b

Tendency: Steady.

CEYLON

The price of No. 1 RSS at Colombo on August 28 was 107¾ (108¼) Ceylon cents per lb.

BANGKOK

The price of No. 1 RSS at Bangkok on August 28 was 28.50 (28.50) US cents per lb.

STOCK MARKET

Continued from page 378

struction kit makers, it was reported, show a satisfactory increase for the first seven months of 1961 over the same period a year ago.

It is clear, however, that most firms are feeling the pinch now from shrinking profit margins. ALBRIGHT AND WILSON, reporting at the halfway stage of their year turned in profits of £4,358,000. Adjusted to include estimated profits of W. J. BUSH for the period, the comparable balance in the six months to June 30 1960, was £4,419,000. The directors have warned that the group's trading profit after depreciation, in the second half of the year is expected to be below the above figure. This is because it will be more fully affected by the narrowing of margins experienced in the first six months of the year and because of depreciation charges on new plants coming into operation in mid-year. The net balance for the half-year is £1,523,000 against £1,491,000 due to a lower tax charge. Hats off to the directors who have had a book published — *Survey of a Chemical Group* — giving a comprehensive account of the character and activities of the Albright and Wilson Group of companies as it is today. It describes the resources behind the group in terms of organization, manpower and research facilities as well as chief products and processes.

IRI NEWS

The Merseyside Section of the Institution of the Rubber Industry is holding a meeting on September 11 at 7.30 p.m. at the Exchange Hotel, Liverpool.

P. G. Croft-White, MA, BSc, of the Shell Chemical Co. Ltd., will speak on the 'Properties and Processing of Polyisoprene Rubber', and the meeting chairman will be P. F. Pierce, AIRI.

This car litter container is packaged in a thermoformed blister of tenite butyrate supplied by Eastman Chemical Products Inc.

Industry INTELLIGENCE

Technical Data

Outdoor Polyester Resin

An advance information sheet on Resin DSR 19132 has been issued by Bakelite Ltd., 12 - 18 Grosvenor Gardens, London, S.W.1. This is a ready-for-use thixotropic polyester resin for wet lay-up laminated applications where cure at low temperatures is required. It has a degree of thixotropy just sufficient to prevent it draining from glass fibre mat on vertical or steeply inclined surfaces of a mould.

The resin, although similar in most respects to Bakelite Resin SR 19037, can be used in those situations where it is necessary to carry out laminating work out-of-doors or under conditions of low ambient temperature. The resin is not suitable for general laminating work at normal temperatures due to its short gelation times. Glass fibre reinforced laminates made with DSR 19132 have good mechanical properties and good water and weather resistance.

New Emulsion Range

Scott Bader and Co. Ltd. of Wollaston, Northamptonshire, has recently introduced a new range of emulsions containing a high proportion of vinylidene chloride. Said to be the first of their type to be produced in the UK, these emulsions will initially be used to coat paper, film, foil or board, making these materials impermeable to moisture and resistant to many chemicals.

Rocol Varnish Coatings

Rocol Laboratories have recently made a thorough examination of the requirements of varnishes for production of resin-bonded molybdenum disulphide lubricating films on metals and other surfaces. As a result Rocol Ltd. is continuing to market Rocol Molytox Plus as a general purpose varnish, especially when ease of application is a factor to be considered, but is now also listing Rocol Molydite Plus, based on a thermo-setting resin as bonding agent.

The new grade, Molydite Plus, is said to give a tougher bonding but requires more care in application and baking at a temperature of 200°C.

The two varnishes are described in Leaflet IFS 111 available from Rocol Ltd., Rocol House, Swillington, Leeds, Yorks.

Primary Plasticizers

Two new primary plasticizers — Benzoflex 2-45 and 9-88 — are now available from Omni (GB) Ltd., 35 Dover Street, W.1.

Benzoflex 2-45 (Diethylene Glycol Dibenzoate) is a primary plasticizer for vinyl resins. It is of particular interest in polyvinyl acetate adhesive formulations, contributing quick grab and good low temperature adhesion properties, and is compatible with ethyl cellulose, cellulose nitrate, butyrate, cellulose acetate and phenol formaldehyde resins.

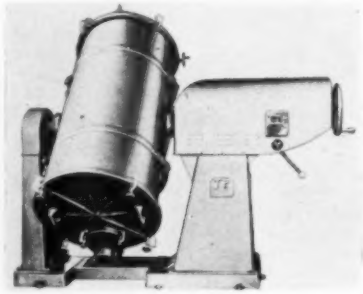
Benzoflex 9-88 (Dipropylene Glycol Dibenzoate) is used as an all-purpose primary plasticizer for formulating vinyl resins. Its features are said to include strong solvent action permitting lower processing temperatures, good tensile strength and good compatibility with other primary and secondary plasticizers.

The main applications for these materials are in the manufacture of vinyl floor tiles and covering, plastisols and laminating adhesives. Technical data sheet, samples and prices are available from Omni Ltd.

Machines, Materials and Equipment

Powder Blender

T. P. Chemical Engineering Ltd. manufactures powder blenders which cover working capacities of 1-5th to 80 cu. ft. and are designed for the blending of powders, chemicals, flakes or crystals. The system on which all models operate is simple, being based on the use of scoops in the centre of each cover plate which, in operation,



pick up a predetermined volume of aggregate from the centre of the moving mass, distributing it evenly to the periphery, twice during each revolution. Vessels are of stainless steel, aluminium, mild steel or acrylic, depending on requirements, and are detachable and interchangeable.

The machines have been tested using a wide variety of products, including plastics moulding powders and dry colouring. Further information can be obtained from the manufacturers at 5 Thornhill Road, Croydon, Surrey.

Electric Motors

Leaflet SL.1 published by Lancashire Dynamo and Crypto Ltd., Acton Lane, Willesden, London, N.W.10, describes the ED range of totally enclosed, fan-cooled, cage rotor motors.

These motors are claimed to be impervious to dust and fumes and are particularly suitable for use in the presence of corrosive chemicals, damp and dirt. Adaptions can be made to the motors for operating in the open under all weather conditions and the additional protection thus offered obviates the need for any further form of enclosure. All materials used comply with British Standard Specifications and the latest types of insulating material are used in coil winding.

Publications

Lead/Polythene Atomic Shield

Lead plays a bigger and bigger part in the field of atomics. Now, in a new brochure — Lead for Radiation Protection — Associated Lead make available in concise form up-to-date information about lead in this role. This brochure gives technical information on the mechanical properties of lead, the forms of lead shielding bricks available and some of the alternative methods of providing reactor shielding.

A section is also devoted to a new material called Densithene which is now being produced by Associated Lead and which is a composite lead/polythene product of particular importance in dealing with neutron and gamma-ray shielding. A special section deals with the use of lead in X-ray work.

This booklet is available from Associated Lead Manufacturers Ltd., Clements House, 14 Gresham Street, London, E.C.2.

Stabilizers for PVC

The new edition of the Meister Stabilizer Handbook should prove of assistance to the vinyl compounder. It is arranged in sections dealing with the major processes used in the manufacture of vinyl plastics products, thus giving the compounder a reference guide to the use of Meister stabilizers. A brief summary of the physical properties of the company's principal products is also given.

Further information and copies of this booklet can be obtained from The Rex Campbell Co. Ltd., 7 Idol Lane, Eastcheap, London, E.C.3.

Shell Moulding News

Durez Shell Moulding News is published monthly by the Durez Plastics Division of Hooker Chemical Corporation and contains articles on applications of Durez products for shell moulding in the US. Omni London, 35 Dover Street, London, W.1, are distributors of Durez products in the UK and will arrange for interested parties in this country to receive regular copies of the news sheet direct from America, free of charge.

Synthetic Rubber Prices

Prices of synthetic rubbers appear regularly in RUBBER AND PLASTICS WEEKLY *on the first week of each month. It will be appreciated if suppliers will give notification of any price changes or additions to their range. C/f duty paid quotations are subject to slight variation due to exchange, ocean freight and insurance fluctuations. Prices are in pence per lb., except where otherwise stated. Grades are expressed as follows:* 1001/2/6 = *grades* 1001, 1002 *and* 1006.

(e-qdp)—Ex-quay duty paid (cifUKdp)—cif UK duty paid (e-i)—Ex-installation (ddp)—Delivered duty paid (e-sUK)—Ex-store UK (ex-wUK)—Ex-warehouse UK (d)—Delivered BM—black masterbatch CBM—cold, black masterbatch CNP—cold, non-pigmented CNS—cold, non-staining COE—cold, oil extended COELC—cold, oil extended, light coloured CO/BM—cold, oil/black masterbatch CPOE—cold, pigmented, oil extended CRE—cold, rosin extended dw—Dry weight HN—high nitrile HNP—high nitrile, powder HP—hot, pigmented HS—high styrene HMW—high mol. wt. LMW—low mol. wt. MHN—medium high nitrile MLN—medium low nitrile MMW—medium molecular weight MN—medium nitrile NS—non-staining TS—total solids RTV—room temp. vulc.

SBR TYPES AND HIGH-STYRENE RUBBER

Ameripol (Goodrich Gulf) (e-qdp)

1000/1/6/7	Hot, non-oil	22.50
1002/12	,, ,,	22.75
1009	,, ,,	24.25
1011	,, ,,	23.25
1013	,, ,,	23.50
1019	,, ,,	24.75
1006/12	Hot, crumb	23.00
1009	,, ,,	25.00
1013	,, ,,	24.00
1500/1/2/9/11	Cold, non-oil	22.50
1605	BM, cold, non-oil	18.75
4658	,, ,,	19.25
1606/8	,,	18.25
1609	,,	20.25
1610	,,	18.75
4651	,,	17.75
4600G2, 4604	Cold, non-oil	22.50
1703	COE, 25% oil	19.75
1705	,, ,,	19.50
1707/8	,, 37.5% ,,	18.25
1710/12	,, ,,	18.00
4700	,, 50% ,,	16.75
4760	COBM, 17.5% oil	16.25
1805	,, 37.5% oil	16.00
1809	,, ,,	15.75
4756	,, ,,	15.75
4759	,, ,,	16.25
1808	,, 50% ,,	15.25
4758	,, 62.5% ,,	15.00

ASRC (American Synthetic Rubber Corpn.) (e-sUK)

1004/6	Hot, non-oil	22.25
1009	,, ,,	24.0
1018	,, ,,	24.75
1019	,, ,,	24.5
1500/2/7	Cold, non-oil	22.25
1503	,, ,,	24.25
1703	COE	20.5
1708	,,	18.0
1712	,,	17.75
1713	,,	16.75
3014	Hot, non-oil	25.75
3105/6	Cold, non-Oil	22.25
3110	,, ,,	24.0

Cariflex (Shell Chemical) (e-sUK)

S-1000	Hot	22.25
S-1002	,,	23.375
S-1006	,,	22.25
S-1009/11/13	,,	24.0
S-1500/2/9	Cold	22.25
S-1600/2	CBM	19.625
S-1605	,,	19.375
S-1606	,,	18.75
S-7652	,,	20.0
S-1703	COE	19.25
S-1707	,,	18.0
S-1709/12	,,	17.75
S-1803	COBM	17.875
S-1806	,,	16.625
S-1807	,,	17.375
S-1808	,,	15.25

Contract terms available.

FR-S (Firestone) (delUK*)

1000/1/4/6/7 and 195	Hot	22.50
1500/2 and 146	Cold	22.50
1703 and 173	OE	19.11
1710/12 and 184	,,	18.00
178	,,	18.25
201	,,	16.71
1009 UK Specialty		23.06
1012 ,, ,,		22.59
1013 ,, ,,		23.59
1014 ,, ,,		26.18
181 ,, ,,		22.50
182 ,, ,,		23.29
147 ,, ,,		20.94
158 ,, ,,		28.00
158-S		27.50

*Import Duty not included

Int. Synthetic Rubber (d)

Intol 1500/2	22.5
Intol 1509	22.5
Intol 1570	23.5
Intol 1006	22.5
Intol 1710	18.0
Intol 1712	18.0
Intol 1778	18.25

Naugapol (Naugatuck Chemical International) (ex-WUK)

1016/9	28.5
1018	29.0
6003	29.0
1022	32.25
1023	34.5
1503	28.25
6102	28.25
1504	36.5
6101	24.5
6100	33.5
K-45	28.25
K-50	28.75
KO-50	29.25
1015	36.5
6004	27.0

ANIC (e-qdp)

1500	22.25
1502	22.25
1708	18.00
1712	17.75
6630	23.25
6632	22.25
6700	16.375

Philprene (Phillips) (d)

1000/6	Hot, non-pig.	22.50
1009	,, ,,	23.06
1018	,, ,,	24.99
1019	,, ,,	24.56
6701	,, ,,	22.50
1500/2	CNP	22.50
1503	,,	24.35
6630	,,	23.75
6632	,,	22.50
1601	CP	19.70
1603	,,	19.25
1605	,,	18.75
1606	,,	18.25
1608	,,	18.75
1609	,,	21.27
6655	,,	19.25
1703	COE	19.50
1708	,,	18.25
1712	,,	18.00
6700	,,	16.85
1803	CPOE	18.13
1805	,,	16.00
1808	,,	15.50
6608	,,	15.33
6753	,,	15.50
6754	,,	15.25
6755	,,	17.50

Plioflex (Goodyear) (ex-wUK)

1006	Hot, non-oil	22.25
1019/1503	CNP, electrical	22.25
1500/2/7/10	CNP	22.25
1006S	,,	22.75
1712C	COE	17.75
1708/78	,,	18.00
1713/15	,,	16.25
1714C	,,	16.00
1773	,,	19.25
224	HS(d)	27.00

Polysar (Polymer UK) (e-sUK)

S/S-630 Hot	22.50
Krylene	22.50
Krylene NS	22.50
Krylene 602 Cold	22.50
Krynol 651 COE	18.00
Krynol 652/4 ,,	18.25
Krynol 653 ,,	18.00
S-X 371 Process Aid	24.08

Synpol (Texas-US Chemical) (e-qdp)

1000/1	Hot	22.25
1002	,,	22.47
1006/7	,,	22.25
1009	,,	22.81
1012	,,	22.38
1013/61	,,	22.25
X274	,,	23.45
8000	,,	22.25
1500/02/51	Cold	22.25
1703	COE	19.25
1707/8	,,	18.0
1711	,,	17.88
1712	,,	17.75
8200	,,	18.0
8201	,,	16.6
8202	,,	16.38
8152	CBM	18.6
8151	COBM	18.2
8253	,,	15.84
8254	,,	15.45
8255	,,	14.8
8267	,,	16.4

(Masterbatch prices US cents per lb. fas Gulf ports)

SBR LATICES

Copo (Copolymer) (cifUKdp)
(10-ton lots)

2101	(dw)	46.3
X-765	,,	40.8
X-800	,,	37.2
2102/5	,,	38.0

Ciago

SB75		38.00
SB69		36.00
SB57P	BM	27.50
SB58P		29.75

Pliolite Rubber (Goodyear) (d)

2000	40

Latex (dw)

2001/4/5/8	40
5350	40

Pliolite Resin (Goodyear) (d)

101A (dw)	44
150 ,,	50
151 ,,	35
160 ,,	50
170 ,,	50

Hycar (B. F. Goodrich) (ddp)

2507 (HS) dw	48

Polysar (Polymer UK) (e-sUK)

Latex, type IV	32.50 TS
Latex, type 722	31.75 TS
Latex, type 741	36.00
Latex, type 781	68.00
(Non-returnable 45-gallon drums)	
Latex, type IV	29.00
	(e-i)
Latex, type 722	27.00 TS
Latex, type 723	27.00
(bulk quantities)	

Int. Synthetic Rubber (ex-wks)

Intol Latex M23B/R23/F28	22.25
Intol Latex 62A	27.0

Dylex (Koppers Int. CA) (fas)

K-42A/52/31/900	31.6

ACRYLONITRILE TYPES

Butaprene N (Firestone) (cifUKdp)

NL	52.5
NAA	56.25
NF	51.5
NXM	60.18

Chemigum (e-s)

N—1	75
N—3A	52
N—5	52
N—6G/7/8/600X	45

Hycar (British Geon) (UKd)
(500-lb. lots and over)

1001	High Nitrile Hot	52
1041	,, ,, Cold	52
1002	MHN Hot	45
1042	,, Cold	45

Hycar (B. F. Goodrich) (ddp)
(500-lb. lots and over)

1411	HNP	66
1432	MHN (crumb)	64
1072	,, (carboxyl)	66
1312	,, (liquid)	55
1043	MLN	51
1014	Low Nitrile	61

I.C.I. (min., 5-cwt. lots) (UKd)

Butakon A-4051 HN Cold	52
Butakon A-3051 MN Cold	45
Butakon A-3002 ,, ,,	45

Paracril (US Rubber) (dwe-sUK)

18-80	Low Nitrile	61
AJ	,, ,,	50
B	MLN	51
BJ	,,	51
BLT	,, Cold	51
BJLT	,, ,,	51
C	MHN	59
CLT	,, Cold	59
CV	,, (crumb)	63
D	High Nitrile	67
ALT		51
OZO		47

Polysar (Polymer UK) (d)

Krynac 800 MN	45
Krynac 802 LN	45
Krynac 803 MN (low Mooney)	45
Krynac 801/5 HN	52
Krynac 804 (MN-cross linked)	45

ACRYLONITRILE LATICES

Butaprene N (Firestone) (cifUKdp)

N-300 (dw)	53
N-400 ,,	60.5

Chemigum Latex (Goodyear) (d)

200	(dw)	65
235/6	CHS ,,	60
245	B ,,	52
245/6/7/8	CHS ,,	52

Ciago

AB61/71	60
AB62/77	52
217OH	60

Hycar (B.F. Goodrich) (ddp)
(dry weight, drum lots)

1551 High Nitrile	66
1552 MHN	57

Hycar (British Geon) (UKd)
(dry weight, 3 drums and over)

1561	High Nitrile	60
1571	,, ,, (carboxyl)	60
1562	MHN	52
1577	(modified)	52

ACRYLIC TYPES

Hycar (B. F. Goodrich) (ddp)

4021 Slab, 500 lb. and over	144
4501 Latex, dry weight	96

BUTYL TYPES

Esso (e-sUK)

Regular 035/150/215	21.75
Regular 217/8	21.75
Regular 325	21.75
Non-staining 165	22.75
Non-staining 268	22.75
Non-staining 365	22.75

Polysar (Polymer UK) (e-sUK)

Butyl 100/200/300		21.75
Butyl 301/400	NS	21.75
Butyl 101	NS	26.25
Butyl 402	NS	22.5
Butyl 600	NS	25.75

Hycar (B. F. Goodrich) (ddp)
(500 lb. and over)

2202 Brominated	68

ISOPRENE RUBBER

Shell Chemical Co. (e-sUK)

Cariflex I-300	26.5
Cariflex I-500 OE	23.5

NEOPRENES

Du Pont (UK production)

W	(del)	38.5
WHV	,,	37.0
WX	,,	40.5
WRT	,,	44.0
GS	,,	41.0
GRT	,,	42.0

(USA production)

AC/AD	(del)	57.125
S	,,	45.625
KNR	,,	75.625
CG	,,	57.125

Latices (UK)

842A	(dwdel) 45-gal. drums	41.0
842A	,, 2,000-gal. tanker	36.0
601A	,, 45-gal. drums	45.0
601A	,, 2,000-gal. tanker	40.0

Latices (USA)

60	(dwdel) 45-gal. drums	51.875
400	,, ,, ,,	54.125
571	,, ,, ,,	49.75
572	,, ,, ,,	51.25
635	,, ,, ,,	53.625
650	,, ,, ,,	54.125
673	,, ,, ,,	62.0
735/6/50	,, ,, ,,	51.25
950	,, ,, ,,	58.25

Polysar (Polymer UK) (e-sUK)

SS-250 HS (bale)	27.00
SS-250 ,, (flake)	27.25
S-X370	23.75
S-X371	24.25
SS-260 (flake)	29.25
Kryflex 200	23.75
Kryflex 252 HS	25.25
Kryflex 202 (HMW Cold polymerized)	23.50

Cariflex (Shell Chemical) (e-sUK)

SP-103	27.25

Cyclite (Durham Raw Materials) 42

HYPALON

(ddp)

20	48
30	60.25
40	50.75

SILICONE RUBBERS

Midland Silicones
(500-lb. lots del)

Stocks	16s. 6d. to 35s.
Pastes	26s. to 35s.
Gums and base stock	36s. to 42s.
Cold-curing silicone rubber	20s. and 23d. 6d.

I.C.I. Silicones

Gums (40-lb. lots del)	39s. 6d.-47s.
Stocks (250-lb. lots del)	22s.-35s.
Pastes (1000-lb. lots del)	27s.6d.-35s.9d.
Silcoset (RTV) (250-lb. lots del)	21s. to 24s.

REINFORCING RESINS AND RUBBERS

I.C.I. (min., 2-ton lots) (UKd)

Butakon S-8551	36.5
Butakon S-7001	33.5

Hycar (B.F. Goodrich) (ddp)

2007 (powder)	42.5

Pliolite (Goodyear) (d)

S—6B	36.5

CLASSIFIED ADVERTISEMENTS

RUBBER AND PLASTICS WEEKLY

APPOINTMENTS VACANT

6d. a word. Minimum 12/6 Box 2/-

APPLICATIONS are invited from highly qualified university trained mechanical engineers with good experience in the design of rubber components. A good knowledge of rubber technology with special design applications for the engineering field. The position offers a lot of scope with a very progressive specialised rubber company in South Africa.—Please write in confidence giving full details of training, age, marital status, education and salary required to the Managing Director, 12 Ashley Place, Victoria Street, Westminster, London, S.W.1. (470)

ASSISTANT chief chemist. A qualified chemist/rubber technologist required with knowledge of the compounding of synthetic rubbers, experience of plastics technology an advantage. The Company manufactures flexible aircraft fuel tanks, specialised rubber mouldings and a range of commercial containers.—Please write giving details of age, education, experience, salary, etc. Personnel Manager, Fireproof Tanks Limited, The Airport, Portsmouth, Hants. (465)

APPOINTMENTS VACANT

(continued)

ANALYST with degree or equivalent qualification. Some experience of rubber or plastics advantageous but not essential. Interesting non-routine work. London area. Salary according to standing.—Box 473. (473)

APPLICATIONS are invited for the position of working manager in mill room of rubber and waste reclaim company, must be fully conversant with Masson Mills, and have knowledge of all types of rubber and plastic waste, etc. Top wages to chosen applicant.—Write giving full details of age, experience and present salary to Rushden Granulating Co. Ltd., 21 Harborough Road, Rushden, Northants. Phone Rushden 3687. (478)

APPLICATIONS are invited for the position foreman extrusion department of a rubber company in Surrey. Pension and bonus schemes in operation.—Write in confidence, giving full details of age, experience and present salary to Box 445. (445)

Esso

RUBBER & PLASTICS TECHNOLOGISTS

with some experience required by

ESSO RESEARCH LTD

to work as Laboratory Assistants in their Abingdon Laboratories. Salaries paid will be commensurate with qualifications and experience, and successful candidates will be appointed to the regular staff.

Applications in writing to: Employee Relations Department (Ref. P.O.L.), Esso Research Limited, Abingdon, Berks. (481)

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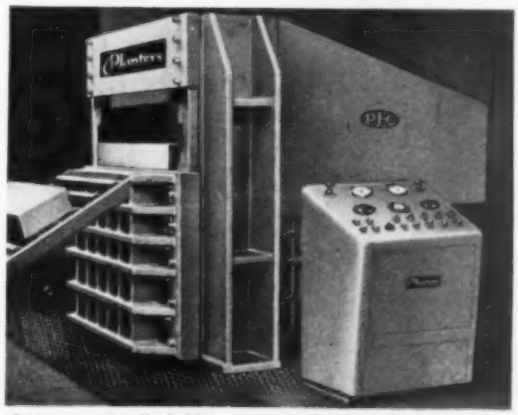

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